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EDUCATIONAL

# CHEMICAL & METALLURGICAL ENGINEERING

McGraw-Hill Co. Inc.

February 18, 1924

25 cents per copy



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## For the Plant and Laboratory Use Electric Heat

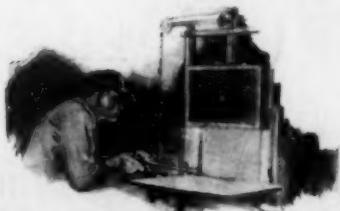
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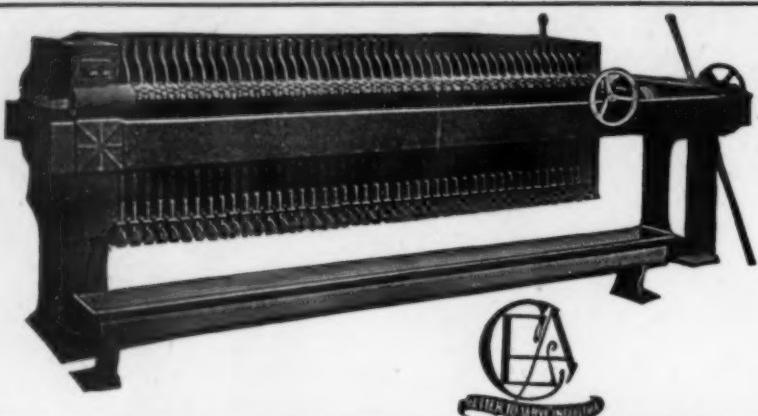
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# CHEMICAL & METALLURGICAL ENGINEERING

*A consolidation of*

ELECTROCHEMICAL & METALLURGICAL INDUSTRY and IRON & STEEL MAGAZINE

H. C. PARMELEE, Editor

Volume 30

New York, February 18, 1924

Number 7

## Another Fiasco in Post-War Government Prosecutions

CHEMICAL engineers are not directly concerned in the suit of the Department of Justice growing out of the construction program of the late war, but they will be interested to learn that the Attorney-General's political prosecution of Benedict Crowell and associated civil engineers resulted in as great a fiasco as did the case against the Chemical Foundation. The court not only dismissed the charges but condemned the inference of graft and criminality that marked the indictment. The accused men have been cleared of alleged conspiracy to defraud the government and their records have been officially declared clean. Apparently the only blot now remaining is on the record of the Department of Justice and the Attorney-General. Engineers generally should spread the facts in this case so that no unwarranted stigma will remain on the reputations of engineers who turned their professional talents to such good account during the war.

## That Olfactory Nerve Again

THERE is an ancient tradition that might be phrased, "All good fertilizer has a bad odor." It is a tradition that has in it more of antiquity than truth. When the early farmers realized that the addition of manure to the soil brought better crops, this now white-haired tradition was born a lusty baby of questionable parentage, and through the centuries it has survived. Before this scientific upstart Chemistry was born, Tradition passed upon fertilizer and said good or bad after taking one smell. Now we talk in terms of per cent potash, phosphorus and nitrogen and forget about the old days, but tradition is not yet dead. It stalks out most unexpectedly, grinning ironically at our per cents and our scientific talk.

During a recent inspection of a modern fertilizer plant in which the process and layout attracted our attention, we idly picked up a handful of the product and sniffed it, noting that there was no odor. Observing the gesture, the superintendent inquired if we would really like to smell something, and offered for our consideration a product of powerful and penetrating odor. It had personality and verve. Unmistakably it was fertilizer!

This, the superintendent explained, is used to "sweeten" the product of the plant. A small percentage only is necessary and it is added because the farmer really feels that he is being cheated if he cannot smell fertilizer. So in addition to putting in a small quantity for flavoring, a few shovelfuls are placed at the door of the freight car so that the farmer will smell it as soon as he opens the door. Almost invariably he picks

up a handful, smells it and pronounces it good fertilizer. The ruse does no harm, because the offensive material has the same fertilizer value as the odorless product of the plant. Thus does tradition persist in exerting its influence even in the shadow of technical operation and control.

## The Controversy Over Muscle Shoals

A FRIENDLY critic has accused us of partisanship in our editorial comment last week on the committee's approval of the Ford offer for Muscle Shoals. Our contempt and condemnation of the misleading, petty politics of the majority report of the Military Affairs Committee was regarded by our friend as a patent indorsement of the bid of the associated power companies. To make certain there shall be no such misunderstanding a re-statement of our views is perhaps in order.

We hold no brief for any of the competing offers, which include, in addition to Mr. Ford's, the joint proposal of the Southern power companies offered in conjunction with the fertilizer proposition of the Mathieson Alkali Works and the Federal Phosphorus Co.; the bid of the Union Carbide Co. of New York, and finally the tender presented by Elon H. Hooker and lately incorporated in Senate Bill 2372 introduced by Senator Norris of Nebraska. It is our firm belief that considered either singly or collectively these proposals represent the best business and technical thought yet directed on the Muscle Shoals project. If serving no other purpose, they afford a basis for constructive negotiation that should not have been overlooked. By comparing the offers issue for issue the committee had an unusual opportunity for reaching a settlement in keeping with its great responsibility. But when the majority entirely disregarded this opportunity and attempted to mislead and confuse the issues in the eyes of the public, it chose for itself a course bordering close to the edge of political treachery.

During the interval since our last comment there has come to hand a minority report of the committee. It also suffers, though perhaps not to the same marked degree, from the disgusting political savor that characterized the views of the majority. Occasionally, however, it reflects something of the calm, dispassionate analysis so necessary to the solution of this problem. In the more controversial parts of the document attention has been given to the arguments of the majority, and it is interesting to find that the more obvious incidents of misrepresentation cited in our editorial have been answered most effectively. These include the fallacy of comparing the financial returns from the power companies over a term of 50 years with Ford's payments over a period of 100 years, the aspersions cast

on the provisions of the federal water-power act, and finally the very questionable effectiveness of the amendment to make Mr. Ford's personal estate the guaranty for carrying out the terms of his contract.

The minority's reference to scientific research and the recent advances in the technology of nitrogen fixation serve to emphasize a phase of the problem that in the past has scarcely had its fair share of attention. Too many on the committee have been inclined to accept as a complete solution for the fertilizer problem Mr. Ford's brief promise to operate Nitrate Plant No. 2 (or its equivalent) at full capacity in order to yield annually not less than 40,000 tons of fixed nitrogen. They forget that the cyanamide process was practically obsolete for fertilizer production at the time the plant was built and that since 1918 real progress has been made in developing more efficient methods of fixation. It is, therefore, very much in the favor of the competing offers that advantage is taken of the results of recent research and plans are laid on the basis of an ever-broadening knowledge of the theory and practice of nitrogen fixation.

The minority report will doubtless serve a good purpose in helping to focus the conflicting viewpoints in the Muscle Shoals controversy. It may demonstrate the futility of attempting to settle by political harangue a highly technical problem of tremendous economic and industrial significance. And it may even result in a turn to the good counsel contained in President Coolidge's first message to Congress—the appointment of a small, select commission for a calm, analytical study of all of the competing propositions.

### Deserved Encouragement For the Patent Office

**P**ROPOSED appropriations for the Department of the Interior include \$155,000 for additional patent examiners to bring the work of the Patent Office up to date. It is evident that Representative Cramton, who was in charge of the measure in sub-committee, appreciates the importance of additional service for this important government office in order that prompt action may be taken on pending patent applications. The thanks of industry as well as of the Patent Office should be accorded Mr. Cramton.

The Commissioner of Patents estimates that if this additional appropriation is granted, as there is every reason to believe it will be, approximately 100 new examiners can be added to the staff. With these examiners the Commissioner is confident that within 2 years the Patent Office will be up to date on its work and will thereafter be able to take action within 60 days on any pending patent case, assuming, of course, that the work does not greatly increase in the meantime. In other words, at no time will industry remain in suspense longer than 2 months before receiving first action on applications. This will be a tremendous step forward in stimulating prompt development of new inventions and in adjusting industrial controversies that are always most bitter when there is grave doubt as to the patent status of product or process.

It remains only for the Senate to place its approval upon this proposed legislation. Those interested will, therefore, do well to communicate with the Appropriations Committee of the Senate, indicating that they would welcome as favorable action by that august body as has been accorded in the House of Representatives.

### Selling the Executive

#### On the Value of Research

**C**ONVENTION programs in which the speakers have endeavored to impress the value of science upon audiences composed almost entirely of technical men have become familiar in recent years and the need for thus repeating an already familiar message has frequently been questioned. At first glance the general session at the recent convention of the American Ceramic Society would seem to fall in the same category, for the central theme was research and the audience was undoubtedly technical in character. But a glance beneath the surface reveals good reasons for the program.

In the first place, this society is fortunate in numbering among its members many executives of the ceramic industry who are sufficiently interested to attend the conventions. Second, the speakers were of such caliber as to attract business men. The program included, for example, representatives of a famous statistical organization, of well-known firms of industrial and chemical engineers and of a great educational institution which has co-operated with the industry in the solution of fundamental problems. And all of these speakers bore witness to the value of research in assuring the success of an industrial enterprise. Even the place of meeting, Atlantic City, favored the presence of the business men of the industry.

Viewed with this background, the program assumes a different aspect. It was the outgrowth of an idea, well conceived and skillfully executed. Many executives were present and there is every reason to believe that they carried away with them a higher appreciation of the value of research. The message had been delivered where it would do the most good.

### Western Advance and Hydro-Electric Power

**T**HE significant advance in technical progress in the Pacific Coast region has been due in no small measure to the provision of electric power and natural gas at a moderate cost. The rate of progress will depend to a similar extent on the thoroughness with which utilization is made of available water power now going to waste. In this connection it is interesting to review the potentialities for development of the Colorado River, which has its source in the snows of Wyoming and Colorado, traverses the Colorado Basin and California, and empties itself into the Gulf of California.

The consummation of an adequate program for the development of the Colorado River will solve three problems: The menace from flood in the lower basin will be removed; water will be available for the irrigation of fertile lands, estimated at 2,000,000 to 3,000,000 acres; and ample hydro-electric power, expected to aggregate at least 4,000,000 hp., will be developed. The removal of the flood menace will encourage initiative in the district; the cultivation of the land will insure general prosperity; and the provision of cheaper power will facilitate industrial expansion on a magnificent scale. The successful application of extra-high tension transmission of electric power in California, up to 220,000 volts, points a way to further research and greater achievement. And engineers are looking forward to an era of electricity when current from far-distant hydro-electric power sites will be transmitted without appreciable loss. This will mean an expansion

of industries in the West in proportion to the reduction in cost of power and its availability throughout those states contiguous to the Colorado River.

It is not surprising that the allotment of benefits from a resource of such national significance should occasion disputed opinion and conflicting claims among representatives of those states that will become beneficiaries of the scheme. The selection of Mr. Hoover as chairman of the Colorado River Commission was a particularly satisfactory appointment. The Colorado River pact—an attempt to reach a common ground of agreement by equitable apportioning—has met with the approval of all the states except Arizona, whose interest in the success of the scheme is such that co-operation and agreement may be expected in the near future.

### An Opportunity for The Non-Ferrous Metals

PRODUCERS of non-ferrous metals may find it profitable to institute an investigation into the ability of various metals and alloys to withstand simultaneously fatigue and corrosion. It sometimes happens in the chemical engineering industries that a machine part that is exposed to a corrosive solution or atmosphere must also withstand continuously repeated stress. If the best metal is to be chosen, this combination of conditions requires some study.

In the failure of a structural member under repeated stress the fracture is facilitated by the presence of a notch or crack. When one realizes that this crack may be an etched line produced by corrosion, it becomes evident that a member which must withstand, simultaneously, repeated stress and chemical attack presents a unique problem. Steel is commonly used where repeated stress is encountered, but it is reasonable to suspect that it is not always the best where the conditions are favorable to corrosion. A series of investigations should shed light on the subject, possibly to the profit of the manufacturer as well as the consumer of non-ferrous metals.

### Use of Fiber Wastes

#### In Paper Pulp Production

WITHIN a few years necessity is likely to force American industry to utilize materials other than wood for the commercial production of pulp suitable for making paper. At present we are using such fiber wastes as wheat straw for making rough cardboard, but as far as is known no mill in America is turning out high-grade paper from such material. Under conditions prevalent in Europe and India, however, where satisfactory wood for pulping has been scarce for many years, attempts to make a fine grade of paper from straw and the like have met with success. The process, invented by a French engineer, A. R. De Vains, consists of successive treatments of the raw material with dilute caustic soda, chlorine hydrate and bleach. Essentially it is an industrial application of the classic method of Cross and Bevan for the isolation of pure cellulose.

One of the merits of the process is that practically equivalent amounts of chlorine and caustic are required. In other words, an independent chemical plant buying only salt and lime is enabled to meet the full requirements of the pulp mill. Practice has shown that 85 to 90 per cent of the cellulose of the straw is convertible to useful pulp—a figure that compares very favorably

with the yields obtained in the standard processes of wood digestion. That the De Vains method is extremely simple, that it is highly efficient in chemical, heat and raw material utilization is not generally understood, largely because so little has been published in English on the subject. For that reason we are pleased to present in this issue a discussion of its merits and of the possibility of its application here. This has been written by a Swiss chemical engineer, J. F. Clerc, who has had experience in building and operating two of the six plants that are operating abroad.

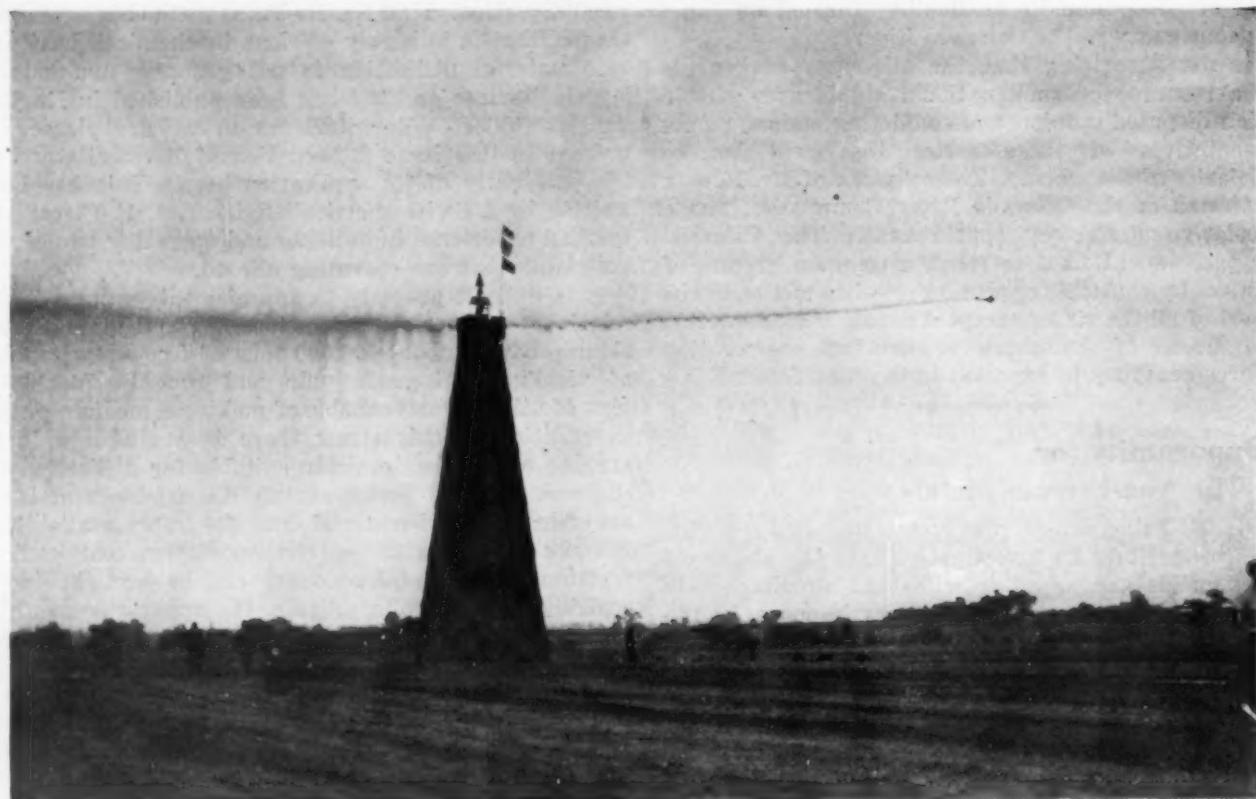
It is difficult properly to appraise this process in its relation to American conditions. The United States alone produces about 600,000 tons of flax straw capable of yielding high-grade pulp and roughly 70,000,000 tons of other straws capable of making a medium grade. In addition to this straw there is available a large amount of bagasse, entirely suitable for utilization by the same means. Unfortunately the existence of large amounts of useful material does not imply availability. Because of gathering and transportation costs only a fraction of the total amounts can be brought in to centrally located mills. Again, the apparatus required for preparation of the fiber, for digestion and most especially for chlorination precludes the possibility of directly converting pulp mills now operating on other processes. Further, the logical centers for mills using wood and for those using straw are widely separated, and frequently in a grain country large supplies of satisfactory water are at a premium.

Although recognizing these difficulties, we must still face and solve the problem of continuing to make paper in this country indefinitely. A growing pulpwood shortage—we are using our wood four times as fast as we are replacing it—practically makes inevitable great increases in the cost of this raw material. It may or may not be that we shall treat straw by the De Vains process, but in any event it should prove profitable for us to consider with care a solution of the problem that has proved satisfactory under European conditions. One thing is certain: This method or another for gaining the same end must be developed for utilizing fibrous materials other than wood which are produced in this country.

### Management and The Scientific Method

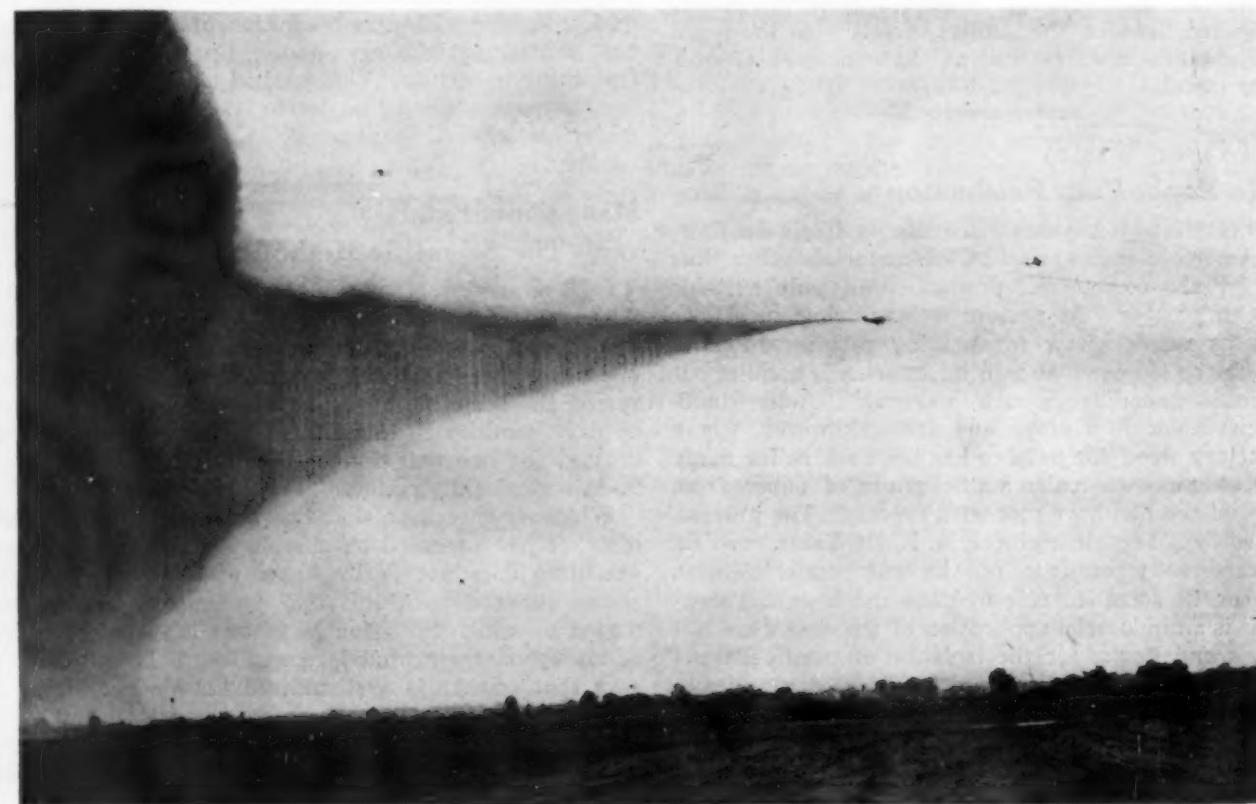
IT IS so obvious that the production department and the research laboratory of a successful process industry must be conducted in a scientific manner that one never stops to think of it. Perhaps for this very reason the scientific approach to work has been almost entirely confined to these departments and has seldom crossed the line that divides them from sales, management and administration.

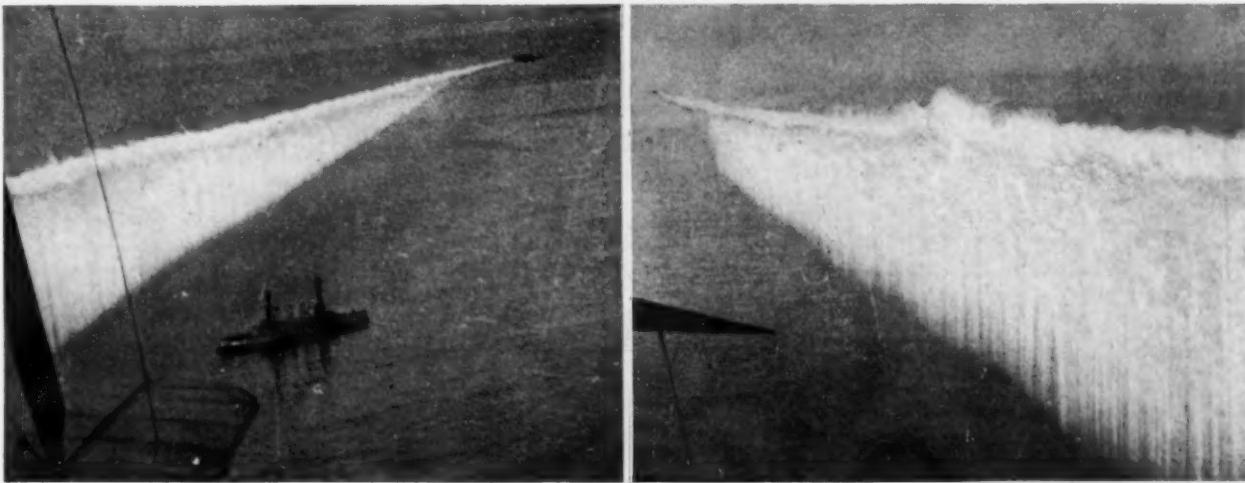
Whatever the cause that has kept science out of the office, it has operated so thoroughly that the average executive does not really know what science is. He seems inclined to think that it is some mysterious means by which the scientist causes ions and electrons to sit up on their hind legs and beg. The dictionary says that science is systematized knowledge. If it is such, surely it can be used with as great success in one portion of an industry as another. The chemist and the engineer have no monopoly of the scientific method. Sales managers and financial men can use it if they will. And if they do, they will find it a welcome substitute for the time-honored "hunch."



*Official photographs, U. S. Army Air Service.*

How the aviator can weave beneath him a protective smoke curtain of titanium tetrachloride. These demonstrations were made at Pulitzer races in St. Louis, October, 1923.





Curtains of smoke could be woven in and around a fleet of battleships in such a way as to render them helpless against bombers flying through or just over the top of the screen

## Chemical Industry Makes Its Contributions to the Aero National Defense

How Airplane Bombing Is Made More Effective by the Use of Smoke Screens That Protect the Airman from Enemy Fire

BY CORLEY P. McDARMENT  
Lieutenant, Air Service, U. S. Army

**B**ITTER controversy continues to rage over the ability of the aerial bomb to sink the battleship of the future, with its thick, heavily armored deck and hull. At the present time, however, no vessel floats that cannot be sunk by the airplane bomber using materials that have already been developed. Although a 300-lb. bomb if properly placed is usually considered large enough to sink or disable any present-day battleship, aerial bombs have been made since the armistice that weigh 4,000 lb. And airplanes that can carry them have been built and used. The tremendous explosive force of a 2-ton depth bomb lends color to the popular notion that in appearance the future battleship will resemble a floating anvil.

It is contended by strong battleship adherents that anti-aircraft fire has been so highly developed that airplanes will be forced to such great heights that, because of inaccuracy, bombing will no longer be practicable. It is claimed that with tracer ammunition which can be observed to an altitude of a mile and with guns that can shoot upward 5 miles, the aviator has lost his last chance to escape unscathed. It is here, however, that products of chemical industry have come to the airman's rescue. Materials have been provided that enable the bomber to fly at any level he pleases, dropping his bombs under a protective shelter of smoke. By the use of the smoke screen airplanes can

approach their targets unseen and release their bombs at an altitude so low that every bomb will be a direct hit.

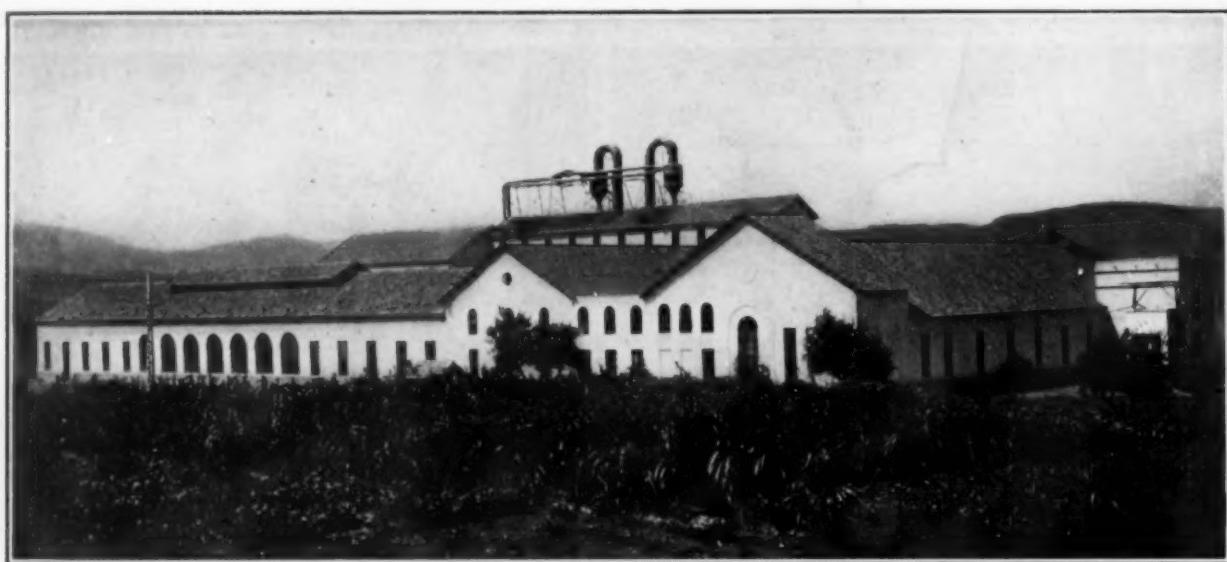
The development dates from last September when the "New Jersey" and "Virginia" were bombed off the coast of North Carolina. In the first attack the big bombing planes came over their targets at 11,500 ft. and dropped their bombs. A few minutes later a single airplane swept across the scene, leaving behind it a trail of white smoke, which dropped to the surface of the water, making a screen that hid the battleships from horizontal view for 18 minutes. Several observers aboard the transport "St. Mihiel" which was standing by with high officials from the army and navy were heard to remark: "Why do they go so high? Why not bomb from 1,000 ft., or just above the smoke curtain?" The advantages are so obvious that in case of hostilities those nations that happen to be equipped will no doubt use this method of attacking the battleships of the enemy.

Small armored planes with a speed of about 200 miles an hour could descend upon a fleet of battleships and weave a catacomb of curtains around them. Then the slower bombing planes lurking a short distance away could fly over at a low altitude and after dropping their bombs with deadly accuracy could disappear behind the smoke curtain. Once a smoke screen or part of a screen is laid, the field becomes

fairly safe from gunfire of the battleships, since the screen can be extended by working out from the completed portion and taking refuge behind it whenever too good a target is being offered. An airplane traveling at a speed of around 200 miles an hour is at best a very difficult target, especially if it is close at hand.

The smoke screen is just at the beginning of its development. Poisonous gas may be mixed with it so that when the wind breaks the screen down, the smoke rolls over the battleship, forcing its personnel to don their gas masks.

There is a real need at the present time for the development of a granular material that could be dropped from an airplane at a height of around 10,000 ft. and after falling to within about 2,000 ft. of the earth suddenly assume the form of the usual smoke curtain. Other chemical developments suggest themselves, for if there was one thing that the late war demonstrated, it was the necessity for research along just such lines. Should a national crisis of the same magnitude again arise, the industries would once more be called upon to furnish the men and materials for chemical production. And in this connection it would be well for all who are now engaged in chemical industry to visualize the use that could be made of their plants and equipment in contributing to the aero-chemical national defense.



Spanish Plant at Benalua

## *De Vains Process for* **Paper From Waste Fibrous Materials**

**How European Mills Utilize Such Fibers as Straw,  
Bagasse and Bamboo for High Grades of Paper**

BY J. F. CLERC  
American Voith Contact Co., New York City

THE De Vains process of pulp making is an industrial application of the old laboratory method for the isolation of cellulose, well known as the "Cross and Bevan method." It consists essentially of treating the material successively with chlorine and with caustic soda with intermediate washings until the fibers are entirely free from foreign materials and consist of cellulose alone. As when straw is treated in the laboratory by this method, a very high-grade cellulose fiber is the product of the industrial process. Approximately 30 to 40 per cent of the weight of most straws used is yielded in the form of finished pulp.

From a chemical point of view the whole treatment can be divided into four phases: Digesting, chlorination, treatment with alkali and bleaching. Fortunately these operations may be conducted with the products of brine electrolysis and lime—that is, chlorine, caustic and calcium hypochlorite. The mechanical details of digesting and bleaching in this process do not differ essentially from those commonly used in other processes. A nearly quantitative amount of reagent is used in digestion and chlorination. In digestion the effect is less vigorous therefore, but it is balanced later in the process by the action of the chlorine, which continues the breaking out of foreign materials commenced by the caustic in the digestion process.

The straw for digestion is prepared by being cut into pieces approximately 1 in. in length in large rotary knife machines capable of turning out about 10,000 lb. per hour. After this operation the cut straw is treated in a centrifugal separator, which knocks out dust and

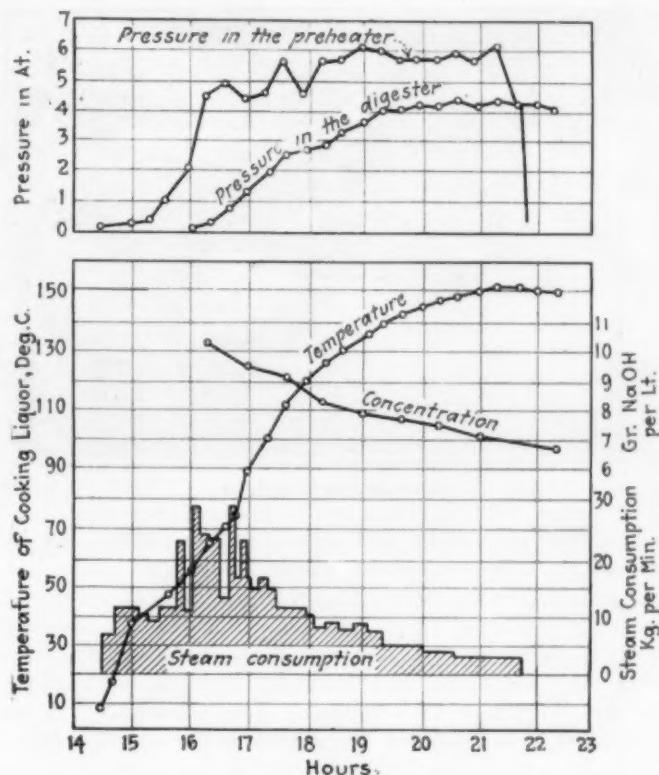
useless particles. Conveyors then carry the raw material to the usual storage bin above the digesters. The cooking operation requires 10 to 12 hours for the complete cycle, charging, heating, cooking, relief, waste heat recovery, two washings in digesters and dumping. Generally this takes place in stationary cylindrical, indirectly heated digesters holding from 30,000 to 50,000 cu.ft. Provision is made for circulating the cooking liquor through a preheater by means of a pump and also for maintaining circulation of this through the digester in either direction. In this way very thorough agitation and uniform treatment are obtainable. Direct cooking might be employed, but it is avoided in order to make possible the use of a very weak liquor. The concentration actually used is about 12 to 14 grams caustic per liter. This is so low that it becomes necessary to avoid further dilution by the condensate of direct steam. In this process caustic equivalent to about 8 to 9 per cent of the weight of the straw is used as compared with 14 to 18 per cent of the weight of wood used in the regular soda process.

The proportion of the total liquor to caustic soda used depends entirely upon the raw material being put through. In most cases, especially in the United States, this material would be straw. It is generally known that it is very difficult, if not entirely impossible, to give a fair average analysis of this raw material, as its composition varies enormously according to the country and the ground on which it is grown. The main factor to be taken into consideration is its cellulose content, but it is likewise important to estimate its

proportion of silica, since it is the ratio of silica to total straw that determines the amount of soda that should be used in the cooking. If particular care is not taken in observing this point, an irregular quality of pulp and losses in yield will result. The influence of silica is felt much more decidedly when a minimum of soda is used, as is the case in this process. In the mills that have been operating abroad, it has been found possible to determine by observation how the straw is running in composition and to modify the digestion, chlorination and bleaching accordingly. Control of the digestion is made through analyses of the liquor from time to time and also from pressure-temperature observations. In general, straw with more than 4 per cent of silica, even with a relatively high cellulose content, is difficult to treat successfully. The following analyses made by Muller show how a few typical straws vary in composition:

	Winter Rye	Winter Wheat	Winter Barley	Oats
Water	14.3	14.3	14.3	14.3
Organic, including cellulose	82.5	80.2	80.2	80.7
Ash, (largely silicate)	3.2	5.5	5.5	5.0
Cellulose	54.0	48.0	48.4	40.0

The purpose of the digestion is to dissolve part of the incrusting materials on the straw and to bring the material into a state that allows its separation into distinct fibers without unduly great expenditure of power. From the digesters the washed pulp is dropped to drainer pits, the liquor drained off and the stuff conveyed to disintegrators on endless rubber belts. Separation made in pulpers or kneaders similar to the broke pulper results from a rubbing action which tends to isolate the particles from one another rather than by a cutting action. By this means a more intimate contact with the chlorine in the following operation is



Actual Diagram Showing Digester Operation

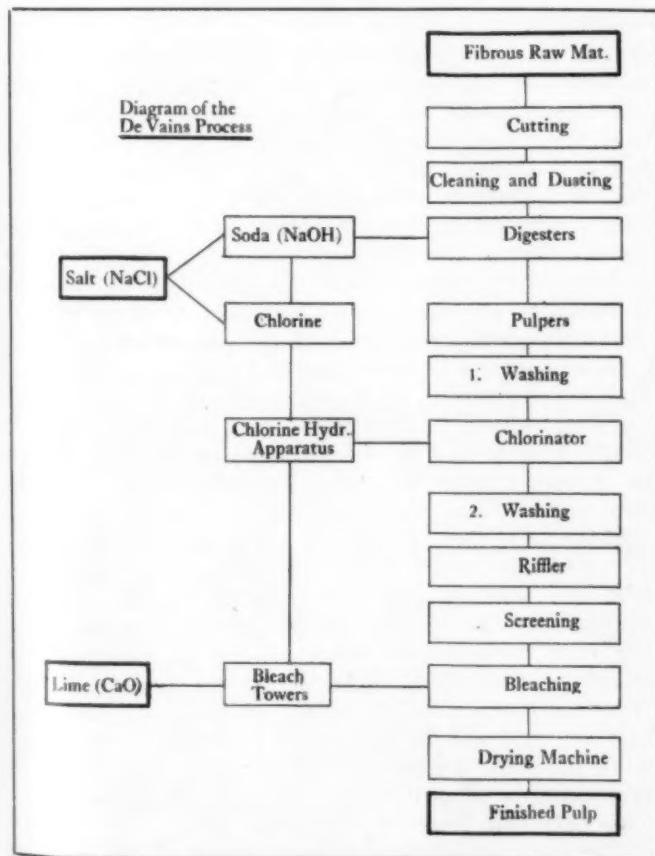
obtainable. After the fibers have been separated, a washing operation is carried out in rotary sieve drum apparatus which eliminates a great part of the remaining waste cooking liquor clinging to the fibers. Thus they are prepared for the action of the chlorine, which must be brought into intimate contact with every particle of fiber.

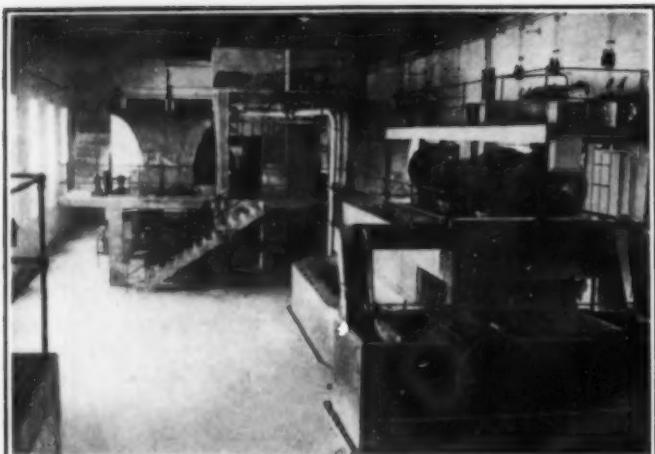
#### HEAT RECOVERY SYSTEM

In the De Vains process no soda recovery is required, as in the old soda or sulphate processes, where close to 80 per cent recovery is essential to commercial success. Consequently a great amount of heat was at first lost when the spent liquors were sent from the digestors to the sewers. At present means have been created to recover this waste heat and to utilize it for preparing hot washing water and for preheating the cooking liquor. Starting an operation with liquor near the boiling point brings several distinct advantages—the raw material is already soaked and softened during the charging period and the digester can be filled more completely—and also the time to obtain working pressure is reached in a shorter time.

A carefully designed waste heat recovery system therefore increases the efficiency of the installation decidedly. The actual diagram on page 264 clearly shows this. It can be seen that there are only three sources of heat losses: (1) Radiation, which can be kept in reasonable limits by insulating preheater, digester and pipings (13 per cent); (2) the hot pulp, which necessarily contains a certain amount of heat with a part of the liquor attached to the pulp (24 per cent), and (3) the waste cooled liquor (20 per cent), which is sent to the sewer a little warmer than the temperature of the cooling water. This cooling water can be brought to a very high temperature and is used in preparing fresh cooking liquor and for washing the pulp.

The actual chlorination may be conducted in various



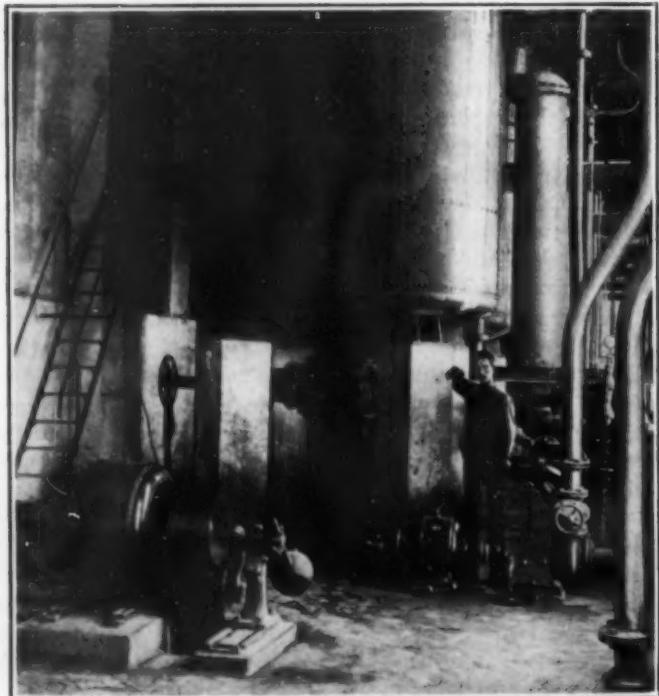


Screens and Bleachers

ways, but essentially the object is the same. As in digesting, it is desired to attack the foreign materials clinging to the cellulose without in any way disintegrating the cellulose itself. Ketone-chlorides are formed in this operation. As formed, they are insoluble salts that must be rendered soluble by treating with alkali before they may be removed. The chlorinator is so arranged that following the action of the chlorine solution, the pulp is treated with caustic for neutralization and in this way the process is maintained continuously.

The apparatus here employed is gas tight—the pulp pumped in at a consistency of 5 to 7 per cent travels under pressure from one end of the chlorinator to the other. This flow is assisted by a specially designed paddle agitator. The chlorine-hydrate solution passes continuously through the apparatus, entering at the same point as the pulp and leaving the chamber with a chlorine concentration of very close to zero.

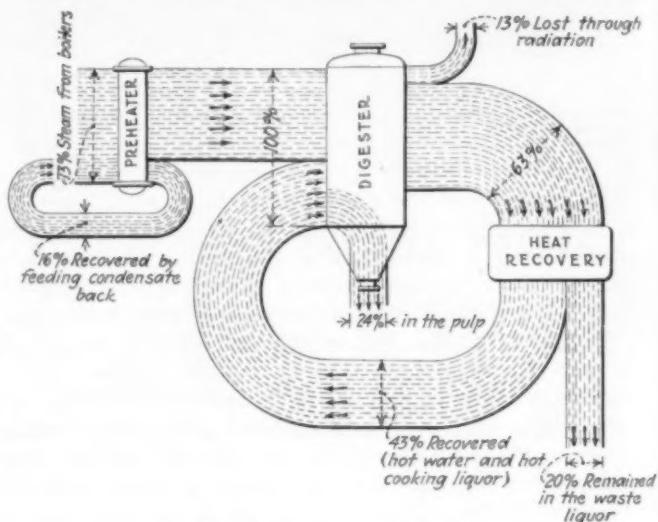
Chlorine has been added to the pulp in various forms. Cathaldi has used it as a gas, but De Vains prefers a form closely represented by the hydrate ( $\text{Cl}_2 \cdot 8\text{H}_2\text{O}$ ). His patents cover the treatment of fibrous material with this compound, which is prepared in a relatively



Preheater and Circulation Pumps

simple absorption system. This consists of towers in series, each filled with tile for increasing contact of liquid and gas. The distribution condition is carefully fixed, as are the pressure and also the temperature. Although much criticized on theoretical grounds, the use of the chlorine-water compound thus prepared works out very satisfactorily in practice.

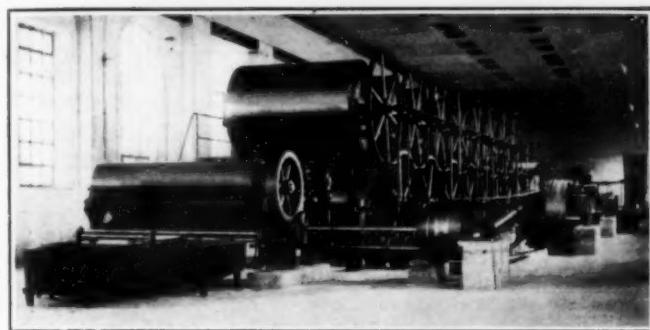
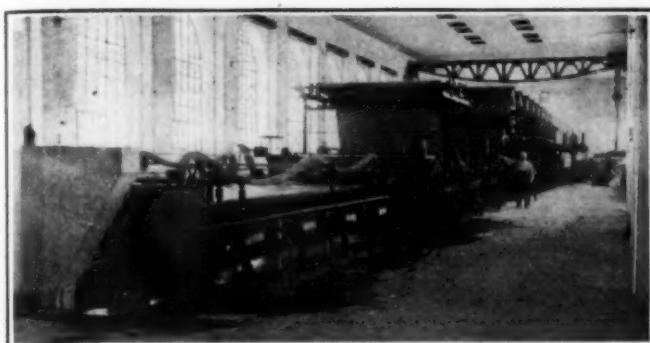
European mills working on this process produce chlorine and soda in their own electrolytic plants. The typical De Vains cell is similar in most respects to the Allen-Moore and operates with the same characteristics. Salt running out with the caustic is ordinarily carried through as such, although its separation by crystallization is recommended if salt cost is high. The soda is stored as it is manufactured and used as needed, while the chlorine flows continuously to the absorbing installation and passes from this absorption



Heat Diagram of Cooking

system into the bleach-making system and in this way none is lost. Under unchanged conditions of pressure and temperature, the chlorine-hydrate solution will have a constant concentration (that is, as long as the gas is furnished in excess, as in this instance) and the total amount of chlorine fixed is ascertained by simply multiplying the concentration by the amount of water passing through the apparatus. It is readily understood, therefore, that the quantity of chlorine absorbed by the water is only a function of its supply. This adjustment, together with the control of the water supplied to the absorbing apparatus, makes possible the constant regulation of the chlorinating process to the required output of the mill. This treatment is also modified according to the qualities of the pulp shown as it comes from the preceding treatment. As the pulp passes from the chlorinators, a slight excess of chlorine is allowed to remain. The addition of alkali, as previously mentioned, neutralizes this excess so that the foreign materials (ketone-chloride) become soluble and also so that the equipment through which the pulp subsequently flows is not corroded by the chlorine. A thorough washing removes the salts formed from the pulp, and the shives, particles of roots and dirt are removed by treatment in screens and rifiers as in the usual process of pulp refining. The final step here consists of centrifugal screening in cages of fine wire that hold back all undigested fiber.

The last operation is the bleaching of the pulp by means of the usual solution of calcium hypochlorite.



Fourdrinier and Drying Cells

The operation is carried out in ordinary bleaching engines (beaters holding about 3,500 cu.ft.) at a consistency of 6 to 8 per cent at a temperature of 35 deg. C. This bleaching process is exactly the same in the De Vains process as in others commonly used; in this particular case it may be stated that the requirements in available chlorine range from 2 to 5 per cent of the weight of dry bleached pulp.

At the Spanish plant, shown in the frontispiece, a total of 1,326 hp.-hr. of power is required per ton of air-dry pulp production. This may be divided into three parts: (a) Preparation of pulp, including all machinery from cutters of raw material through the drying rolls of paper machine, 563 hp.-hr.; (b) chemical plant, including electrolysis, bleach production, pumping of all chemicals, 629 hp.-hr. and (c) general service, repair shop, water pumping and boiler operation, 134 hp.-hr. This shows that when only a small amount of power is available, it is feasible to purchase chlorine and caustic outside.

#### ECONOMICS INVOLVED IN THE PROCESS

So far straw, esparto and rice fibers have actually been used as raw materials by this process. Successful tests on an industrial scale have also been carried out with bamboo. To judge whether or not the process might be used advantageously in this country, several points have been considered. One of the most important factors is, of course, the possible supply of suitable raw material. With the decreasing pulp wood resources, there is no doubt that other raw materials capable of pulping must be found. The first would naturally be straw, which has long been discussed as a substitute for the pulp wood. This material is available in immense quantities, is entirely suitable for paper-making purposes, is easy to treat and may be converted into a very high-grade product. Close to 800,000,000 tons of straw is produced annually in the United States and Canada, of which approximately 10 per cent might be used for making the highest grade of paper, while the remainder would be suitable for a medium grade

and for other purposes. Naturally, the difficulties of baling and shipping this material are great and it could not be expected that anywhere near the entire amount would be gathered. The Canadian Pacific Railroad has made a special investigation of this project and believes that traveling baling presses in the field could care for an area of 100 square miles or so, working with a crew of nine men 10 months a year. The prices paid for the straw would be more than sufficient to cover the actual expense involved in shipping it from the farm and with paper products selling at the prices now current, there could be little doubt that the baling and selling of straw would be economically feasible for the farmer. In this way he would find a new outlet for a material that he had formerly burned in the field.

It is obviously impossible to predict or even to ascertain with any degree of accuracy what fraction of the total amount of straw produced might be available in pulp making. That the De Vains process offers very promising possibilities, however, even in the face of the difficulties mentioned, is evidenced by its growing use in Europe, as well as by the favorable consideration it has already received in this country. The large electrochemical industries in this country have developed highly efficient methods for producing these materials and might be able to supply chlorine and caustic at a lower figure than that at which it could be produced locally. This would have to be settled according to the location and availability of power at the proposed mill.

Another raw material not available in the northern part of the country but which is produced in large quantities in the Southern states is bagasse, the refuse of cane-sugar mills. This is largely used at the present time as a fuel, but with very low efficiency. By the De Vains process it has been shown that this material may be profitably transformed into pulp.

It is not possible to give here definite general figures demonstrating the economical advantages of this process. In order to define the exact conditions under which a mill can operate profitably, such factors as those of raw material costs, power, sale, shipping facilities, etc., must be carefully considered. There can be little doubt, however, that the simplicity of the process in question possesses sufficient merit to attract more and more technical men interested in the problem of forest conservation as the production of paper and pulp rises. Sooner or later the De Vains process will in all probability be tried out in the United States.



Electrolytic Cell Room



## Value of Research Emphasized by American Ceramic Society

Annual Meeting at Atlantic City Indicates a Growing Appreciation of the Benefits of Technical Research and Reports Notable Progress in Many Fields

EDITORIAL STAFF REPORT

**F**ORSAKING for the moment ceramic industrial centers in order to enjoy the winter charm of Atlantic City, the American Ceramic Society met in annual convention at the Hotel Traymore, Feb. 4. For 3 days the attention of nearly 500 members was held by the general and technical sessions, but Thursday found them back in the field again, divided into groups each with a 2-day itinerary of interesting visits.

From the climatic point of view, Monday, Feb. 4, was perfect and the fact that nearly 300 resisted the natural temptation to join the throngs on the Boardwalk speaks well for the excellence of the program and is an indication of the genuine interest in the activities of the industry that permeates this organization.

### TRAINING FOR INDUSTRY

That the ceramic industries are alive to the need for more technical men and are willing to co-operate with educational institutions in developing men of the highest type was emphasized by President A. F. Greaves-Walker in the opening address of the convention.

It is only 30 years since the first collegiate course in ceramics was established in this country at Ohio State University. Since then departments have been formed at Alfred University, Iowa State College, Rutgers, Illinois, University of Washington and University of Saskatchewan, and three others have been announced during the past year, Georgia School of Technology, North Carolina and Penn State. All told, these schools have turned out a total of about 350 engineering graduates and in addition about 150 completed short or special courses.

Admitting that the task of developing ceramic

engineers is perhaps more difficult than is the case with some of the older branches of engineering, Mr. Greaves-Walker was nevertheless inclined to question whether sufficient stress was being placed on those fundamentals that would most quickly enable the new graduate to take his place in the industry. From experience in employing technical graduates, Mr. Greaves-Walker outlined his ideas of the qualifications which were essential as follows:

1. Accuracy.
2. Absolute loyalty.
3. Willingness to follow instructions.
4. Mechanical knowledge.
5. Understanding of fundamentals of psychology.
6. Working knowledge of drafting and machine design.
7. Thorough grounding in chemistry and thermodynamics.

As regards these, 4 and 6 are somewhat closely related and very important. The recent graduate usually shows a woeful lack of knowledge of the mechanical equipment used and it takes from 6 to 12 months for him to acquire this. The importance of this factor may be better appreciated when it is realized that in the heavy clay industry particularly many plants fail simply through inability to keep the equipment running steadily.

It is recognized that the ceramic engineer should be able to handle men. Indeed, the superintendent usually expects the engineer to handle a gang of men as well as, if not better than, a non-technical foreman. Unfortunately, it is quite difficult to provide training along this line, but a knowledge of the fundamentals of psychology as indicated by the fifth point will be very helpful.

Research was the theme of the remainder of the general program, and as noted in last week's issue,

p. 244, the subject was treated from many angles by speakers of recognized authority. The preparation of such a program involves careful planning and much hard work, and the program committee has certainly earned the gratitude of the whole society.

#### NEW OFFICERS ANNOUNCED AT BANQUET

In order to interfere as little as possible with the opportunities for getting acquainted, afforded by individually arranged entertainments or button-hole talks, only one social feature was arranged, the banquet Tuesday evening. According to custom, this was also the occasion for inducting into office the newly elected officers and members of the board of trustees: President, R. D. Landrum; vice-president, R. M. Howe; treasurer, H. B. Henderson; trustees: F. H. Rhead, R. R. Danielson, J. S. McDowell, J. C. Hostetter, C. C. Treischel, C. Forrest Tefft, R. L. Clare.

Tuesday and Wednesday were given over to the technical programs of the seven industrial divisions. A short account of the proceedings of three of these, Refractories, Glass and Enamel, is given below. Well-attended and informative meetings were held by each of the other divisions as well, but limitations of space prevent a more detailed consideration of their activities. One important point that cannot be overlooked, however, is the election of officers, as follows:

**Art Division**—Chairman, Mary G. Sherrill; vice-chairman, Margaret K. Cable; secretary, Herbert Kirk.

**Heavy Clay Products Division**—Chairman, F. T. Owens; vice-chairman, John Martin; secretary, Amos Potts.

**Terra Cotta Division**—Chairman, W. D. Gates; secretary, B. S. Radcliffe.

**White Wares Division**—Chairman, F. H. Riddle; secretary, C. C. Treischel.

### Refractories Division

**Thermal Conductivity, High-Alumina and Sillimanite Refractories, Burning and Open Hearth Refractories Among Important Problems Considered**

Thermal conductivity of refractories was the first subject to be considered by this division. M. F. Beecher outlined some of the results that have been obtained at the research laboratories of the Norton Co. using a modified Hepplewhite method. The relative order of the conductivities of the refractories studied, referred to the pressed fireclay mixtures, is: pressed fireclay, 1.0; sillimanite, 2.1; magnesia, 3.2; fused alumina, 4.1; silicon carbide, 4.8. Details of the investigation were published in the January, 1924, *Journal of the American Ceramic Society*, pp. 19 to 28. Prof. A. S. Watts announced that his work during the past year had been confined largely to a search for a standard heat transfer unit and to testing out a system whereby it will be possible to have practically uniform radiation in all directions.

R. F. Geller outlined the work of the Federal Specifications Board on refractory specifications. When completed these will be mandatory to the government departments, but of course are merely suggestive to the field. It is hoped, however, that they will prove of value in the latter connection. During this work tests were made on a number of high-alumina brick, and



Robert D. Landrum

Newly elected president of the American Ceramic Society

curves showing the results were thrown on the screen. In discussion it was pointed out that except for fusion point there was not enough difference in brick containing more than 70 per cent alumina to warrant the additional expense of manufacture.

High-alumina brick have been tried in glass tank regenerators, and M. C. Booze, of Mellon Institute, found that the dust present in one furnace under study tended to form an adherent slag on brick of this type. The slag would build up and threaten to choke up the checkerwork. The dust reacted with silica brick, when these were used in the checkers, to form a fluid slag which drained toward the bottom and thus kept the regenerators free from obstruction.

Hewitt Wilson's paper on sillimanite as a refractory was presented by C. E. Williams. Brick made from the crushed fused ingot of synthetic sillimanite having an  $\text{Al}_2\text{O}_3:\text{SiO}_2$  ratio of 1:1 failed under load below cone 18. Increasing the ratio to  $3\text{Al}_2\text{O}_3:2\text{SiO}_2$  produced an ingot with a finer crystalline structure and with plates of corundum scattered through the mass. This material was found to bond easily with a mixture of plastic clay and alumina and the resulting brick withstood a load of 25 lb per sq.in. at cone 32 (3,100 deg. F.; 1,700 deg. C.).

An equilibrium diagram of the system  $\text{Al}_2\text{O}_3:\text{SiO}_2$  was discussed by N. L. Bowen, and this served to explain in a measure the results of Wilson's work. The only compound present in the equilibrium diagram is the  $3\text{Al}_2\text{O}_3:2\text{SiO}_2$ . At 1,810 deg. C. this breaks up into liquid and corundum. That is, it melts incongruously; there is no true melting point and consequently no eutectic. Natural sillimanite breaks up at 1,500 deg. C. into liquid and crystals of the 3:2 compound. It is not



R. M. Howe

Vice-President American Ceramic Society

surprising that the two compounds have been confused, for many of the properties are very similar and even the refractive indices, which vary for the pure compounds, are almost identical when the 3:2 product contains iron or titanium.

#### BURNING PROBLEMS DISCUSSED

Burning problems were considered in a group of four papers. A paper by Ralph A. Sherman, "Combustion in Kilns Burning Refractory Ware," presented the results of some of the co-operative investigations that have been conducted by the Bureau of Mines and the Refractories Manufacturers Association. Combustion in rectangular and round down-draft kilns was thoroughly studied. It was found that the attainment of uniform temperature throughout the kiln is, in general, a problem of the uniform distribution of the hot gases rather than one of gaseous combustion.

Pyrometers were considered by R. P. Brown, tunnel kilns by Philip Dressler, while E. E. Ayars called attention to the tests that were being made on firing refractories in round down-draft kilns equipped with Gates stokers.

#### CONES VS. PYROMETERS

The question of using cones for temperature measurements came up for discussion and Prof. Edward Orton, Jr., called attention to the fact that the cones were designed to measure heat work rather than strictly temperature. The time element is a most important factor in the burning of clay wares and the cones are excellently adapted for use as burning guides. Some confusion has resulted from attempts to use cones in connection with fusion point determinations. For such work other methods that do not involve the time element are more suitable.

#### CONSUMERS' PROBLEMS

Continuing the co-operative discussions begun last year in Pittsburgh, a symposium on consumers' problems was held. Lieutenant-Commander H. H. Norton described the simulative service test that has been

developed by the navy for selecting refractories for oil-fired marine boilers. Dr. F. A. Harvey and E. M. McGee developed a grinding device for determining the relative resistance to abrasion of silica lining blocks for coke ovens. The electric brass furnace refractory situation was discussed in a paper by H. W. Gillett.

Wednesday afternoon was given over to the open-hearth symposium, held under the auspices of the U. S. Bureau of Mines with D. A. Lyon as chairman. All phases of the refractory problem for open-hearth furnaces were considered in an important series of papers. M. C. Booze, of Mellon Institute, opened the discussion with a paper showing the application of fire-clay brick in this type of furnace. Silica brick were next considered by H. C. Harrison, of the Bureau of Mines, followed by R. E. Griffiths, of E. J. Lavino & Co., who gave numerous examples of chrome bottoms and back walls. Operating conditions as they affect the life of refractories were covered in detail by Bradley Stoughton and C. A. Smith, C. E. Williams, and Sydney Cornell.

### Enamel Division

#### Plasticity, Muffle Atmosphere, Zirconia as an Opacifier, Warpage and Better Equipment Among Subjects Discussed

Chairman Homer F. Staley opened the meeting of the Enamel Division with a survey of the present status of the enameling industry, indicating some of the paths that investigators might profitably follow in seeking to advance the technology of this industry.

Plastic properties of enamel slip were studied by R. D. Cooke, and his results attracted wide attention. Employing the theories and apparatus developed by Professor Bingham, he determined the mobility and yield point of enamel slips, not only in the normal condition but also when set up or deflocculated with a number of the usual agents. He was able to show that yield point and mobility had a definite relation to draining properties of the enamel slip.

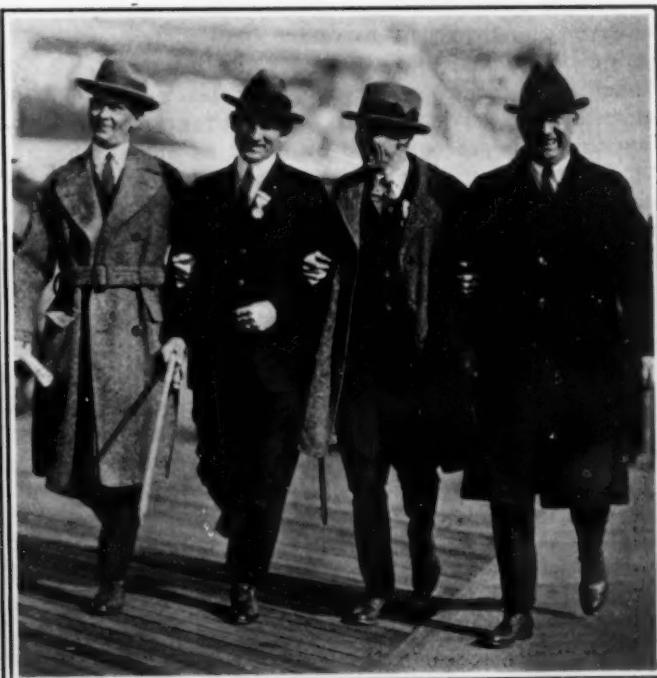
Mr. Cooke also presented a paper on "Effect of Muffle Atmosphere on Firing Enamels," in which it was demonstrated effectively that a film of  $Fe_2O_3$  is absolutely essential in order to get a good fit between ground coat and the surface to which it is applied. Ground coats burned in an atmosphere of nitrogen blistered and small blisters developed in the presence of  $CO_2$ . When air was admitted, perfectly smooth results were obtained. As the burning time was 1 minute, the effect of adding air at definite periods was tried. It was found most desirable to use air during the second quarter of the burn. By calculation, it was shown that at least 6 cu.in. of air per sq.in. of iron must be present in order to get best results.

#### OBTAINING OPACITY WITH $ZRO_3$

C. J. Kinzie presented a study of the opacifying effect of zirconia and zirconia products. Apparently the physical form of the material is more important than the chemical purity in developing opacity and it was shown that  $ZrO_3$ , having suitable physical form can give opacity equal to that developed by tin oxide. In some cases it may require more zirconia, but the lower cost frequently will offset this and make the substitution profitable. For some uses chemically pure zirconia



Out to See and Be Seen



might be desirable, but here also the question of proper physical form must be considered.

R. R. Danielson, T. D. Hartshorn and W. N. Harrison reported the latest results in the work that has been in progress at the Bureau of Standards on warpage of sheet iron and steel in the enameling process. Warpage was found to be more or less dependent upon the temperature at which the firing is carried out and also to a certain degree upon the coefficient of expansion of the enamel. This latter point was demonstrated by the difference between pieces that had been enameled on one side only and those completely covered.

Mr. Danielson also gave a progress report on a study of the field of feldspar enamels for sheet steel. Twenty formulas were investigated. Some of these indicated the possibility of using high-feldspar enamels and the best were selected for further study.

F. G. Jaeger described a continuous spraying outfit for applying enamel to stove parts, table tops and other flat work. The ware is carried on a cable past the operator, who is thus able to increase materially his rate of production. The following speaker, R. A. Weaver, suggested that the cable be extended through the drier and thus further reduce unnecessary handling. Mr. Weaver then outlined the best equipment for modern enameling plants.

At the regular business meeting, the following officers were elected for the Enamel Division: Chairman, R. R. Danielson; secretary, H. G. Wolfram.

### Glass Division

#### Life of Tank Blocks Most Important Problem Facing the Glass Industry

In order to appreciate fully what has been accomplished by the Glass Division, it is only necessary to consider that 5 years ago the papers presented before this division were almost without exception of interest only to the few members concerned with problems of pure science. There was very little information in a form that made it available for the practical man. At the present meeting, most of the time was spent in discussing the great practical problem that confronts the industry and threatens to retard development—the decreasing life of tank blocks.

It must not be gathered from this statement that fundamental data have no place on the programs. On the contrary, a paper conceded by many as among the best on the program was that of A. Q. Tool, describing studies extending over a period of 5 years on the endothermic and exothermic effects produced when glass is heat-treated. Another paper, by L. A. Palmer, A. N. Finn and A. E. Williams, was of a similar character, as it considered viscosity measurements that have been made with apparatus developed at the Bureau of Standards. A large group of commercial glasses containing the usual ingredients—sand, lime, soda, magnesia and alumina—will be studied. Batches will be determined and the best temperature for measurement selected. It is hoped that these results will thus be directly applicable to plant problems. All work done on the commoner glass batches is of interest to the industry as a whole, and continued support is thus assured.

Although the other papers on the program dealt with a wide variety of subjects, there was hardly one that did not lead, in discussion at least, to the question of

tank blocks. This was easily the most interesting subject of discussion and as indicated above is really the most important technical problem before the industry today.

The facts seem to be that the life of tank blocks is decreasing at a rate which if continued to 1930 would indicate almost zero life at that time. Of course, such



Members of Refractories Division at Disston's

a conjecture is quite unreasonable but it serves to indicate how serious the problem is. Naturally when it comes to explanations there are two sides to the question, one represented by the refractory manufacturer, the other by the glass-house operator. The refractory representatives claim that the adoption of machines has increased the service requirements for refractories, temperatures being higher and the furnaces being pushed to utmost capacity, thus exerting an eroding influence due to the more rapid motion of the glass or metal over the surface of the blocks. On the other hand, the glass men contend that less care is being used in making the blocks. Whatever the true reason may be, it seems certain that such co-operative discussions as took place at the meeting will go a long way toward evolving a real solution of the problem.

#### GLASS DIVISION OFFICERS

The business session included the drawing up of an appropriate resolution on the death of M. J. Owens and the election of the following officers: Chairman, G. E. Barton; secretary, A. N. Finn; councilors, F. C. Flint, A. E. Williams, A. Silverman.

#### Industrial Excursions

Four separate trips were arranged, covering a wide variety of ceramic activities. The Heavy Clay Products, Terra Cotta and White Wares Divisions combined forces and descended upon Trenton and Perth Amboy. The Glass Division visited the Kimble Glass Co. at Vineland and the Illinois Glass Co. at Bridgeton.

Members of the Refractories Division spent Thursday in the vicinity of Philadelphia studying the application of refractories to electric steel, crucible steel and heat-treating furnaces at the plants of Henry Disston & Sons and the Dodge Steel Co. This trip was preceded by luncheon at the Manufacturers Club as guests of E. J. Lavino & Co. Friday two plants in Baltimore were visited; the well-designed magnesite and chrome brick plant of the General Refractories and that of the Locke Insulator Co.

In Baltimore the Enamel Division visited the National Enameling & Stamping Co., Jones Hollow Ware Co., A. Weiskittel & Son Co., Porcelain Enamel & Mfg. Co., Baltimore Enamel & Novelty Co. Saturday a trip was made to Washington to inspect the Bureau of Standards laboratories.

# Using a Modified Mond Producer for Low-Temperature Carbonization

This Well-Known Process Changed to Produce Richer Gas and More Tar, With Increased Overall Thermal Efficiency

BY C. H. S. TUPHOLME  
London, England

**T**HE Power Gas Corporation process of low-temperature carbonization is actually an adaptation of the already well-known Mond process. In the original process bituminous slack was treated, using about  $2\frac{1}{2}$  tons of steam per ton of coal. This process gave per ton about 135,000 cu.ft. of gas of 140 B.t.u. per cu.ft., leaving the producer at 1,063 deg. F., and about 90 lb. of ammonia. The tar yield was around 6 to 10 gal.

The Power-Gas Corporation has now developed two types of this kind of byproduct producer gas plant as substitutes for the original Mond recovery process. These byproduct producer gas plants have been designated the "true low-temperature" and the "semi-low-temperature" producers, in accordance with whether the final gas temperature is considerably below the tar evolution temperature of the fuel or approaches it.

The reasons this firm has considered it advantageous to undertake such extensive industrial research are that with existing industrial conditions of expensive labor, fuel and first cost of plant, not to speak of the possibility of a considerable future reduction in the market price of sulphate of ammonia (due to successful synthetic ammonia processes), the economical position of a Mond gas plant becomes an entirely different one from what it was previous to the war; so much so that during the last few years a very large number of gas-producer plants in this country using the Mond byproduct recovery process have been shut down or worked without recovering the ammonia.

The designers, Beswick and Rambush, turned their attention to the improvement of the yield of the quality of the tar oils, at the same time maintaining high yields of gas and sulphate of ammonia. The problem here was to keep down the temperature in the top of the producer. In the original Mond producer the temperature in the top section is seldom less than 1,000 deg. F. As a result the coal is subjected to high-temperature carbonization as soon as it enters the retort, and the oils are consequently cracked. In order to retain the low-temperature oils Beswick and Rambush set out to reduce the temperature in the top of the retort so that it should not exceed 550 to 750 deg. F.

After experiment, it was decided to deepen considerably the fuel bed, retaining its usual width, so that the entire charge is slowly gasified, low-temperature carbonization being effected at the top of the producer. The effect of the alteration is shown in outline in Fig. 1.

The semi-low-temperature design is applied mainly to existing producers, and at the present moment there are four large Mond gas plants being modified to work on this system. For the sake of comparison, Fig. 1 shows how these Mond producers are being modified, the section elevations of the producer before and after alteration being drawn side by side.

It will be seen that the total quantity of the fuel under gasification has been increased considerably by extending the height of the fuel bed and modifying the shape of the top plate, while the central fuel feeding bell of the Mond producer has been replaced by a circumferential fuel feed. The latter arrangement is obtained by extending the mouth of the gas outlet pipe to a position somewhat below the surface of the freshly charged fuel, the gas outlet pipe being "luted" in the coal. Nearly all gas producers of the ordinary static type tend to burn more intensely at the edges, but when the gas outlet pipe is arranged as shown all gas must pass through the center of the top of the fuel bed before leaving, thus insuring that the central fuel particles are heated up simultaneously with those particles that are nearer to the lining. As a matter of fact, the fuel temperatures in a byproduct recovery producer with central gas outlet pipe across a horizontal plane

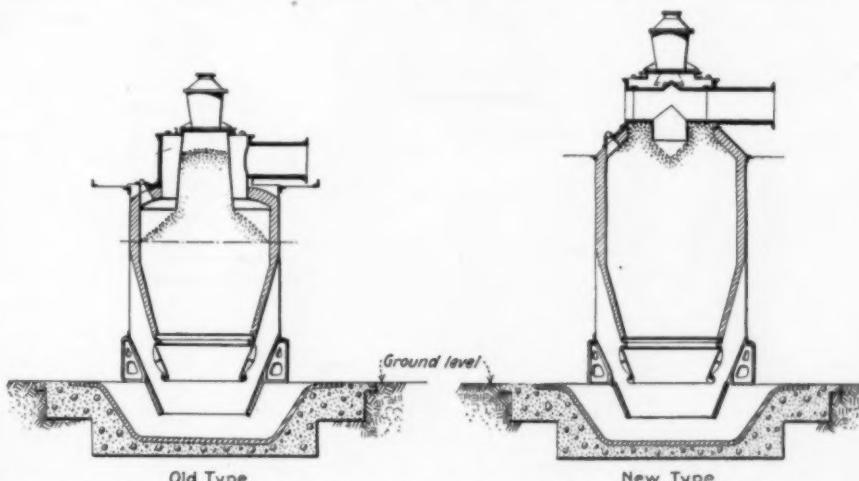


Fig. 1—Comparative Sectional Elevations of Original and Modified Mond Producers

just below the internal fuel (inverted) apex have been found to be practically even and vary, according to the load factor, between 480 and 840 deg. F. The time factor in the semi-low-temperature producer is from  $\frac{1}{2}$  to 1 hour.

The advantages that have been proved as attendant upon this conversion are:

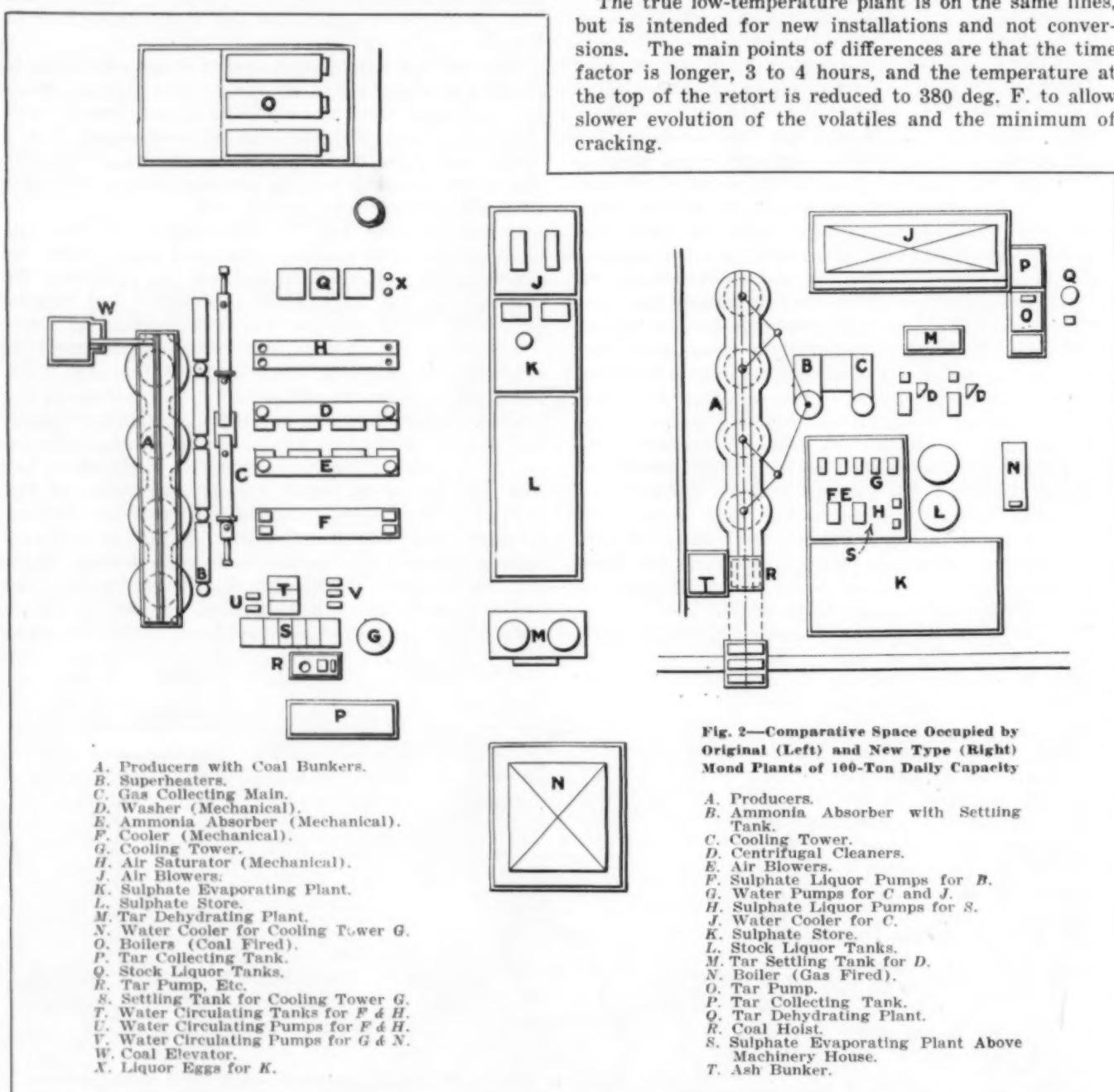
1. Average daily gasification is increased by 50 per cent.
2. The calorific value of the gas is increased from 140 to 160 B.t.u. per cu.ft.
3. The carbon in the ash is reduced from 30 to 15 per cent.
4. Ammonia yield is unaltered, though steam consumption is nearly halved.
5. The tar yield is increased by 30 to 40 per cent.
6. The thermal efficiency of the process, aside from steam saving, is increased by 10 per cent.
7. No superheating of the air blast is required, thus effecting an economy in maintenance charges.

In a 7-day test on a Mond producer converted to semi-

low-temperature operation the following results were obtained. (See paper by N. E. Rambush, West of Scotland Iron and Steel Institute, 1922-1923 *Trans.*):

Average load on producer (tons of dry coal per 24 hours)..	25.2
Net calorific value of fuel, B.t.u. per lb. of dry coal..	11,577
Grading, 55 per cent above $\frac{1}{2}$ in., 8 per cent below $\frac{1}{2}$ in.	
Maximum gas rate—cu.ft. per hour reduced to 0 deg. C. and 760 mm. Hg (N.T.P.).....	297,000
Minimum gas rate—cu.ft. per hour reduced to 0 deg. C. and 760 mm. Hg (N.T.P.).....	44,100
Temperature of air blast, deg. C.....	81
Temperature of gas blast, deg. C.....	350
Total steam—lb. per lb. of fuel, a large part of which is raised in the air tower.....	1.33
Gas Analysis:	
CO <sub>2</sub> , per cent.....	15.2
CO, per cent.....	12.7
H <sub>2</sub> , per cent.....	27.8
CH <sub>4</sub> , per cent.....	3.8
N <sub>2</sub> , per cent.....	40.5
Net calorific value B.t.u. per cu.ft. (N.T.P.), per cent...	160.3
Dry tar in crude gas, gal. ton dry coal.....	19
Ammonia in crude gas, lb. of sulphate of ammonia (25 per cent) per ton of dry coal.....	99
Nitrogen content of dry coal, per cent.....	1.5
Nitrogen recovery efficiency, per cent.....	60.7

The true low-temperature plant is on the same lines, but is intended for new installations and not conversions. The main points of differences are that the time factor is longer, 3 to 4 hours, and the temperature at the top of the retort is reduced to 380 deg. F. to allow slower evolution of the volatiles and the minimum of cracking.



The first commercial installation of the low-temperature plant has met with considerable success, and the following are test figures over 4 days:

	First Day	Second Day	Third Day	Fourth Day
Approx. load in tons per 24 hours	7.4	5.6	5.75	5.0
Pressure loss in cm. W.G.	20	21	24	22
Blast temperature, deg. F.	165	165	165	165
Gas analysis (in per cent)				
CO <sub>2</sub>	7.0	7.0	8.0	8.4
CO	21.5	22.0	21.0	20.0
H <sub>2</sub>	20.0	19.0	21.0	21.0
CH <sub>4</sub>	5.7	5.4	5.4	5.1
N <sub>2</sub>	45.8	46.6	44.6	45.5
Total combustibles	47.2	46.4	47.4	46.1
Net cal. value B.t.u.	185.8	182.0	184.3	178.0
Steam decomposed, per cent	70	83.7	88.0	83.4
Sulphate of ammonia by analysis (c.c. of N acid per cu.m.)	182	171	226	230
Tar oil by analysis (grams per cu.m.)	19.5	23.1	27.8	39.5

These results are obtained from a typical coal, the analysis of the raw fuel being:

	Per Cent
Ash	8.1
Volatile matter	36.2
C	73.6
H <sub>2</sub>	5.3
O <sub>2</sub>	14.0
N <sub>2</sub>	1.56
Net calorific value, 12,200 B.t.u. per cu.ft.	
Swelling	46

The amount of this fuel treated per 24 hours was 5.25 tons, the steam used being 0.94 lb. per pound of coal. The air blast temperature was 165 deg. F., and the exit gas temperature was under 390 deg. F.

The yields from a ton of this coal are: 120,000 cu.ft. gas of 178 B.t.u. per cu.ft.; 20 gal. of tar; 90 lb. ammonia (56 per cent efficiency); gasification efficiency, including tar, was 91.5 per cent and gasification efficiency, excluding tar, was 78.4 per cent.

A typical comparison of the three processes, Mond, semi-low-temperature and true low-temperature, is interesting. From a fuel of this analysis: Ash, 12.0 per cent; volatile matter, 37.0 per cent; N<sub>2</sub>, 1.4 per cent; net calorific value, 12,000 B.t.u. per pound, the results from the three processes are as shown in the following table:

	Ordinary Mond Process	Semi-Low-Temperature Mond Producer	True Low-Temperature Producer
<b>Gas Analysis (per cent)</b>			
CO <sub>2</sub>	16	11.0	8.5
CO	11.0	17.5	20.5
H <sub>2</sub>	25.0	21.6	20.5
CH <sub>4</sub>	2.7	3.3	5.5
N <sub>2</sub>	45.3	46.7	44.9
Net ca. value B.t.u. cu.ft. (N.T.P.)	135.9	153.7	182.3
Theoretical flame temp. of gas	1,588	1,697	1,775
<b>Operating Results:</b>			
Gas yield per ton totally dry fuel gasified, cu.ft. at N.T.P.	133,500	133,000	118,000
Ammonium sulphate yield, lb. per ton T.D. fuel gasified	90	95	90
Tar yield, gal. totally dry tar per ton totally dry fuel gasified	10	18.5	21
<b>Thermal Efficiencies (per cent)</b>			
Gas producer efficiency proper			
Excluding tar recovered	68	76	80
Including tar recovered	74	87.2	92.3
Overall gas producer efficiency, including coal for steam raising without burning tar recovered (A), per cent	53.5	64.4	69.5
Burning tar for steam raising (B), per cent	56.7	72.8	80.0
To get heat in cold clean gas equivalent to that obtained by burning 100 tons in plant using Mond process and boilers we must burn (A), tons	100	183.2	77
(B), tons	100	78	70.9

It will thus be seen that there is a saving on fuel expenditure in the low-temperature plants of between 20 and 30 per cent of the consumption in the original Mond process. When the gas is to be used for boiler

firing or furnace heating the higher flame intensity of the low-temperature gas over the ordinary Mond gas will lead to an additional saving.

The low-temperature plant can be installed today at about the same cost as a Mond plant under pre-war conditions; can be operated with from 10 to 30 per cent less labor, depending on the size of the installation; and can be accommodated on half the ground space. Fig. 2 is a comparative block plan of two byproduct producer gas plants of 100 tons daily gasification capacity; one being the original Mond plant and the other a low-temperature plant.

### Oils From Carbureted Water Gas

In co-operation with the American Gas Association, the Department of the Interior, through the Bureau of Mines, is investigating the relation of properties of gas oils to the gum-forming properties of carbureted water gas. Serial 2,537, just issued by the Bureau of Mines, deals with the effects of operating practice on the composition of the light oils from carbureted water gas. A general outline of the gummy meter problem was presented in Serial 2,503.

Carbureted water gas is a mixture roughly of 80 per cent water gas by volume and 20 per cent oil gas. The latter, though small in relative volume, supplies more than half of the heating value of the gas under the present-day standard.

In the course of these experiments, three gas oils in present-day use were cracked under especially controlled conditions simulating those of the carbureted water-gas industry, and the light oil in the resultant gas was studied. It was found that gum troubles in distributing systems are basically dependent upon the composition of the light oil of the gas, and especially due to the heavier unsaturated hydrocarbons of the aromatic series.

Gas oils of different properties cracked under identical conditions give rise to different amounts of gum-forming constituents in the resulting gas. The temperature at which cracking is done has a marked influence on the amount of gum-forming constituents in the gas. These decrease sharply with increase of temperature within cracking limits.

The time and contact factors in cracking are tangible and somewhat elastic as control measures. They are interdependent, and both act reciprocally to changes of temperature.

Serial 2,537, "Relation of Operating Practice to Composition of Light Oil From Carbureted Water Gas," by R. L. Brown, E. F. Pohlman and H. G. Berger, may be obtained from the Bureau of Mines, Washington, D. C.

### Would Use Waste Limestone

Thousands of tons of pure limestone in sizes under 4 in. are either entirely wasted at many lime plants or are sold for uses that bring a very small return to the producer. The Department of the Interior, through the Bureau of Mines, has undertaken a study of possible methods of utilizing such material, the study relating particularly to methods of burning it into lime. Preliminary work has been done at the non-metallic minerals station of the Bureau of Mines, New Brunswick, N. J., on present uses of waste limestone and on the success with which the rotary kiln is used with fine materials. Arrangements were made for field investigations at several Pennsylvania plants.

# Designing an Efficient Evaporator

An Example of How the Fundamental Principles Underlying This Process Can Be Applied on a Commercial Scale To Industrial Materials

BY HUGH K. MOORE

Technical Director, Brown Co., Berlin, N. H.

HAVING already discussed the fundamental principles of multiple-effect evaporation\* it now remains to show the type of evaporator proposed, which will take into consideration these principles. The curves given in the preceding articles were based on data obtained on an iron tube 3 in. in diameter and 25 ft. long, inclosed in a steam jacket and very slightly inclined from the horizontal. It will thus be seen that the static head was limited to the liquor over the tube, which probably does not exceed one-eighth of an inch on the bottom of the tube and is nothing at the top of the tube. The liquor is fed into the tube.

Now, while the question of distribution of liquor in one tube without any static head is a simple matter,

\*See *Chem. & Met.*, vol. 29, pp. 1102-5, 1144-7 and 1190-3, December, 1923, for preceding installments, all of which are based on a paper presented before the American Institute of Chemical Engineers at Washington, Dec. 5, 1923.

## EVAPORATION

The author of this paper has requested us to state that this is not a discussion of sulphite liquor, although in our opinion it deals with a process that may upset many long-standing notions regarding the disposal of this waste product. Rather it takes up the problem of designing an evaporator in accordance with certain sound scientific principles. It is therefore of pertinent interest to all industries facing evaporation problems, whether the product be sugar, milk, glue, gelatine, glycerine, tanning extracts or other organic liquors or the hundreds of important inorganic materials such as salt, ammonium sulphate, alum, barium chloride, calcium chloride or the many sodium and potassium salts.—*The Editor.*

## A UNIT PROCESS OF CHEMICAL ENGINEERING

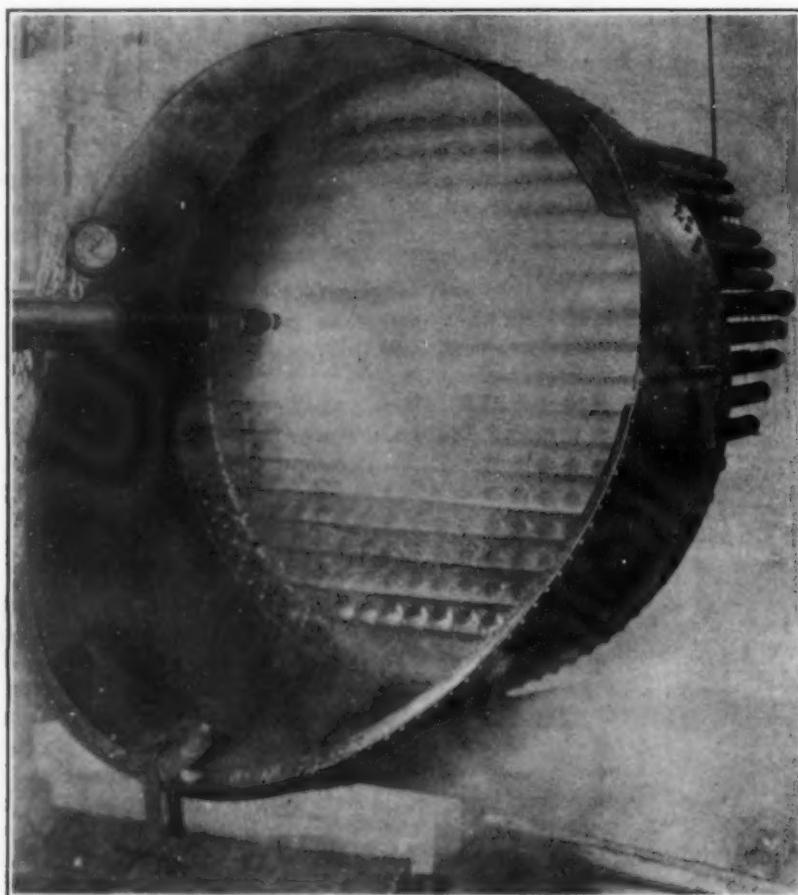


Fig. 1—Photograph Showing Arrangement of Nozzle and Tube-Sheet From Front End

the question of the same distribution in a multiplicity of tubes nested together as in a boiler is not so simple. Means must be provided to accomplish this result or the project will fail, for it must be remembered that the constants which have been determined experimentally do not hold true for any conditions except for those under which they were determined.

The method proposed was to spray the liquor by means of a pump against the tube sheet spaced off horizontally by gill flanges or troughs so that the liquor striking between the tubes would be collected and pass through the tubes in its particular zone and not run down the tube sheet. (See Figs. 1 and 2.) The second step was to obtain a nozzle that distributed evenly and yet one that would not plug from even large-sized impurities. Having some doubt about the nozzles, we conducted experiments with several. We found one nozzle that sprayed evenly. This was made by the Spray Engineering Co. The other nozzles tried gave hollow cones or small angles of discharge. As the other makes of nozzles were rejected for this purpose, it is unnecessary to encumber this paper with the data thereon, though they are exceedingly interesting. The first step was to determine the angle of horizontal discharge, for this must be known in order to determine the distance of the nozzle from the tube sheet. The vertical angle will vary according to the distance of the nozzle from the tube sheet, owing to the effect of gravity on the water during its travel. This factor, however, was

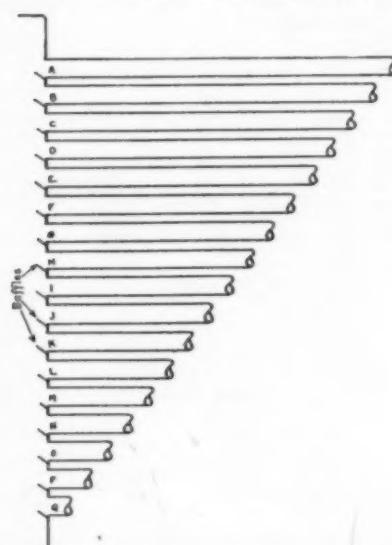


Fig. 2—Schematic Arrangement of Tube-Sheet and Spray Nozzle

Baffles were fitted to each row of tubes as shown

not of great concern, as it could be taken care of by lengthening the gill flanges.

A discussion of the various tests to which spray nozzles were put and the conclusions drawn from them would make a small volume in itself, so the present treatment will be limited to only a few of the results applicable to this subject.

Each nozzle projects practically a solid spray. At the higher pressures the spray carries farther, although the distance, for each nozzle separately, at which the spray is 7 ft. wide does not vary to any appreciable extent with the pressure. The same holds true for a spray 12 ft. in width.

In Fig. 3, which is typical of a number of the writer's charts, "Distance in feet" represents distance along the floor directly in front of the nozzle. The height of the spray at a width of 12 ft. could not be measured for every pressure, owing to the fact that the lower portion of the stream struck the floor inside the proper point. Neither could the

"By observing all the principles outlined in this article it is possible to design an evaporator for sulphite liquor which will evaporate so cheaply that the fuel value alone will furnish heat enough to do the evaporating of the liquor and leave an excess which will cut down the use of coal to such an extent that substantial dividends can be paid upon the whole installation. If this sulphite liquor is to be used as a fuel, it can be dried by either atomizing through furnace gases or used in the method already explained in the explosion process, using an oxidizing atmosphere rather than a reducing atmosphere."

H. K. Moore.

nozzle be raised further, as then the upper portion of the stream would strike the ceiling. This testing was done indoors, to avoid error caused by wind.

The points on the outside of the sprays where measurements were made were taken where an appreciable number of drops fell. Consequently, some liquid fell outside of

the measured area, but probably not much.

The distance at which the spray is 7 and 12 ft. wide was found by sighting along the two sides of the spray from the nozzles, lining off the path of the spray on the floor, and then measuring distance sought.

All measurements were made with water flowing through the same supply line for all three nozzles. Nozzles 10 BA and 10 B fit the same size pipe; nozzle 11 A taking a larger pipe. Connection in the case of the latter was made by means of a bushing.

#### ANGLES OF SPRAYS

Angles of sprays were calculated as follows:

$$\frac{a_1}{c} = \text{tangent}$$

$$\frac{a_2}{c} = \text{tangent}$$

$$a_1 + a_2 = \text{angle of spray}$$

Nozzle No. 10 BA

5 lb. pressure

$$a_1 = .875 \quad 0.875 = \tan a_1 = 41^\circ 12' \\ a_2 = .775 \quad 0.775 = \tan a_2 = 37^\circ 48'$$

$$c = 1.0 \quad \text{Angle of spray} = 79^\circ$$

30 lb. pressure

$$a_1 = .975 \quad 0.975 = \tan a_1 = 44^\circ 18' \\ a_2 = .675 \quad 0.675 = \tan a_2 = 34^\circ 6'$$

$$\text{Angle of spray} = 78^\circ 24'$$

From the angle of spray between 5 lb. and 30 lb. pressure, the conclusion was drawn that the angle of spray does not vary to any great extent with increase in pressure as indicated below.

Nozzle No. 10 B

5 lb. pressure

$$a_1 = .975 \quad 0.975 = \tan a_1 = 44^\circ 18' \\ a_2 = 1.195 \quad 1.195 = \tan a_2 = 50^\circ$$

$$\text{Angle of spray} = 94^\circ 18'$$

30 lb. pressure

$$a_1 = 1.125 \quad 1.125 = \tan a_1 = 48^\circ 24' \\ a_2 = 1.025 \quad 1.025 = \tan a_2 = 45^\circ 42'$$

$$c = 1.0 \quad \text{Angle of spray} = 94^\circ 06'$$

Nozzle No. 11 A

5 lb. pressure

$$a_1 = 1.025 \quad 1.025 = \tan a_1 = 45^\circ 42' \\ a_2 = 1.825 \quad 1.825 = \tan a_2 = 61^\circ 18'$$

$$c = 1.0 \quad \text{Angle of spray} = 107^\circ$$

30 lb. pressure

$$a_1 = 1.125 \quad 1.125 = \tan a_1 = 48^\circ 24' \\ a_1 = 1.525 \quad 1.525 = \tan a_2 = 56^\circ 42'$$

$$c = 1.0 \quad \text{Angle of spray} = 108^\circ 06'$$

Table III shows the distances from the nozzle tip in which the spray covers the widths of 7 and 12 ft. respectively. Having determined this, we are now in a position to

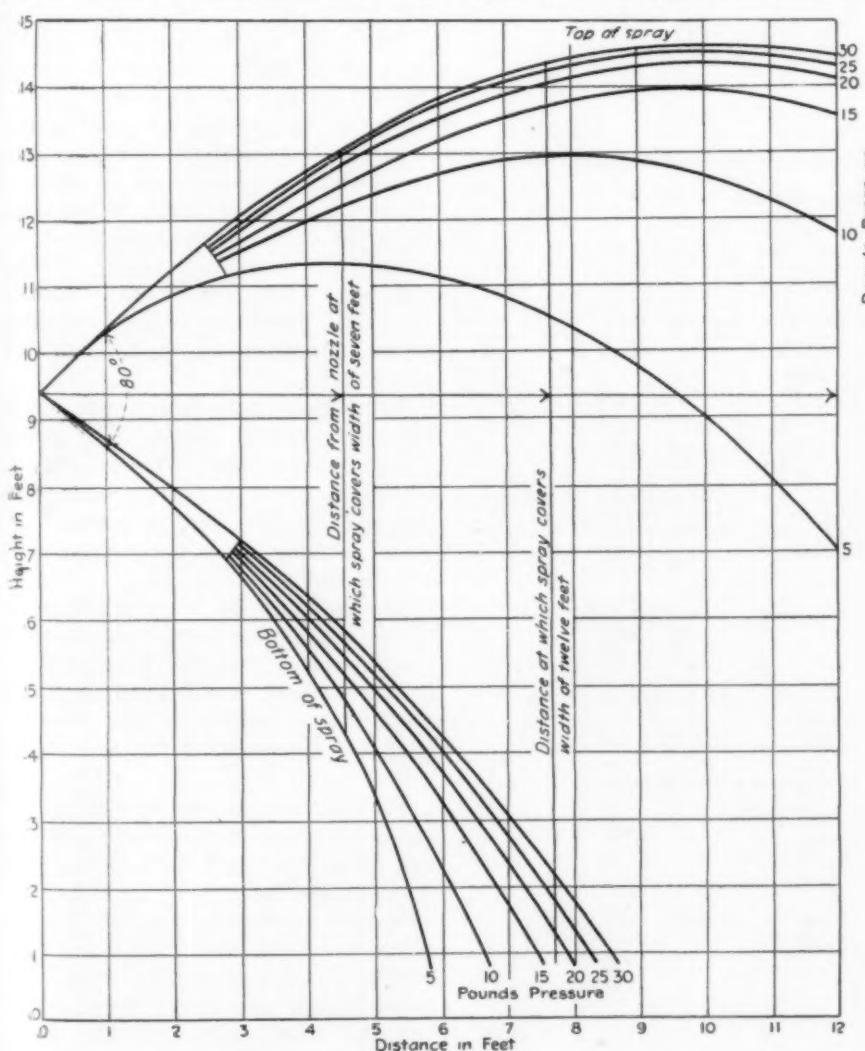


Fig. 3—Typical Chart Showing Distribution According to Different Pressure  
Sprayco nozzle 10BA,  $\frac{1}{8}$  in. orifice, parallel to horizontal.

study the evenness of the distribution over the tube sheet. A tube sheet with tubes expanded therein, was made as illustrated by Fig. 1. It will be seen that the tubes are of such lengths that pails can be hung thereon and actual measurements made of the water flowing through each of the tubes. Fig. 5 shows a sketch of the tube sheet in which the horizontal rows are designated by letters and the vertical rows by numbers.

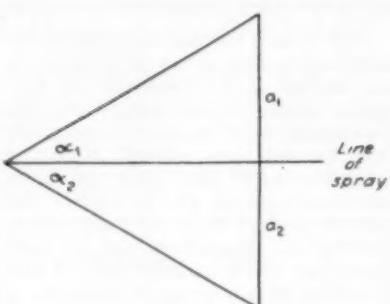


Fig. 4—Angle of Spray

Table I—Height of Spray When Width Is 7 Ft.						
	Nozzle No. 10 BA					
Lb. pressure	5	10	15	20	25	30
Top	11.35	12.30	12.50	12.85	13.00	13.10
Bottom	4.30	4.75	5.15	5.40	5.65	5.80
Height of spray, ft.	7.05	7.55	7.35	7.45	7.35	7.40
Difference from mean height	-0.31	+0.19	-0.01	+0.09	-0.01	+0.04
Distance from nozzle	= 4.5 ft.					
	Nozzle No. 10 B					
Lb. pressure	5	10	15	20	25	30
Top	12.00	12.63	12.85	12.95	13.05	13.18
Bottom	4.23	4.35	4.50	4.70	4.85	4.95
Height of spray, ft.	7.77	8.28	8.35	8.25	8.20	8.23
Difference from mean height	-0.41	+0.1	+0.17	+0.07	+0.02	+0.05
Distance from nozzle	= 3.66 ft.					
	Nozzle No. 11 A					
Lb. pressure	5	10	15	20	25	30
Top	11.65	12.30	12.49	12.62	12.75	12.83
Bottom	4.10	4.35	4.50	4.70	4.85	5.00
Height of spray, ft.	7.55	7.95	7.98	7.92	7.90	7.83
Difference from mean height	-0.3	+0.1	+0.13	+0.07	+0.05	-0.02
Distance from nozzle	= 2.87 ft.					

Table II—Height of Spray When Width Is 12 Ft.						
	Nozzle No. 10 BA					
Lb. pressure	5	10	15	20	25	30
Top			13.70	14.05	14.28	14.38
Bottom			0.65	1.3	1.8	2.15
Height of spray, ft.			13.05	12.75	12.48	12.23
Difference from mean height			+0.42	+0.12	-0.15	-0.40
Distance from nozzle	= 7.6 ft.					
	Nozzle No. 10 B					
Lb. pressure	5	10	15	20	25	30
Top				14.4	14.6	14.75
Bottom				0.1	0.3	0.5
Height of spray, ft.			14.3	14.3	14.3	14.25
Difference from mean height			+0.02	+0.02	+0.02	-0.03
Distance from nozzle	= 6.25 ft.					
	Nozzle No. 11 A					
Lb. pressure	5	10	15	20	25	30
Top	12.0	13.6	13.8	14.0	14.0	14.2
Bottom	0.0	0.9	1.3	1.6	1.8	2.0
Height of spray, ft.	12.0	12.7	12.5	12.4	12.3	12.2
Difference from mean height	-0.35	+0.45	+0.25	+0.15	+0.05	-0.15
Distance from nozzle	= 4.75 ft.					

Table III—Comparison of the Three Types of Spray-Nozzles						
Distance from nozzle-tip to point where spray is						
Nozzle No.	Supply Pipe, In.	Diameter Orifice, In.	7 Ft. in Width	Type B, Ft.	Type C, Ft.	12 Ft. in Width
10BA	1	1/8	4.5	...	...	7.60
10B	1	3.66	...	...	...	6.25
11A	2	2.87	...	...	4.75	...
1	1	1	5.54	...	...	9.50
2	1	1	4.27	...	...	7.31
3	2	1	4.12	...	...	7.07
4	2	1	3.22	...	...	5.62
1	2	1	...	6.23	...	10.67
2	2	1	...	5.68	...	9.72
3	2	1	...	4.10	...	7.02

Tests were then made of the uniformity of distribution of sprays over a vertical tube-sheet. The tube-sheet (1-in. iron-plate), 7 ft. in diameter, has 259 3-in. boiler-tubes expanded into the holes drilled as shown. On the feed-side of the sheet a baffle-plate or trough was fitted snugly to the sheet, directly under each row of tubes and inclined upward so as to cover approximately one-half of the lower portion of each row, as shown in the figures. The entire sheet had a cylindrical shell attached, as may be seen in Fig. 2. Water was furnished by a 6-in. centrifugal pump, through a 4-in. line, the largest nozzle tested having a 4-in. supply-pipe. The tubes were cut in various lengths to enable catching and measuring the volume delivered by separate tubes.

The distance between nozzle-tip and tube-sheet was such that the spray covered the entire sheet, the water striking the sheet being deflected from it and the side of the shell and caught by the baffles, or troughs, allowing all to run through the tubes.

Table IV is typical of the results of a great many tests with Spraco nozzles using the tube-sheet as a means of measuring the uniformity of the distribution of the spray. The particular tube delivering a certain amount of water may be located, from the table, on the tube-sheet, by finding the number designated in the row across the center and reading directly up or down to the particular letter representing each row of tubes.

In making these tests every other tube was tested, rather than every tube, since an idea of the uniformity of the spray over the sheet and not exactly the precise amount of water issuing from the nozzles was sought for.

Throughout the tests made with the nozzle having a 3-in. supply-pipe the distance from the nozzle-tip to the tube-sheet was 3 ft. 7 in.; and from the nozzle-tip to the floor of the shell surrounding the sheet 4 ft. 1 in.

In the case of the nozzle having the 4-in. supply-pipe, the corresponding distances were 3 ft. 3 in., and 4 ft., respectively.

Higher pressures than 15 lb. per sq.in. were not used with the nozzle having a 4-in. supply-pipe, because at these higher pressures, water striking the upper parts of the sheet splashed over the troughs and fell back into the shell. At present,

wider troughs are being made which it is hoped will remedy this difficulty.

#### AN AUTOMATIC FLOAT VALVE

In almost all evaporators we have a storage of liquor in each effect and thus the regulation from effect to effect can be hand controlled by valves. In the type shown we have no storage capacity and thus a new problem enters into the running of such an evaporator. If no liquor passes through the tubes of any effect, the evaporator ceases to function. In order to overcome this difficulty it becomes absolutely necessary to have some device that will automatically control each evaporator. Such a device is preferably a float valve so piped up that the level of the liquor in the exit well of the evaporator shall control the amount of spray entering such an evaporator. Fig. 6 shows such a valve designed for this purpose. As pressures vary from time to time in the evaporators, it is necessary to have a valve that works independently of any pressures. The liquor into each evaporator is controlled by its valve and the force is supplied by a centrifugal pump situated 36 ft. below the bottom of the exit well. It will readily be seen that a series of valves like the above responds to any change made in the rate of discharge from the final evaporation and may be compared to a row of blocks set on end, wherein

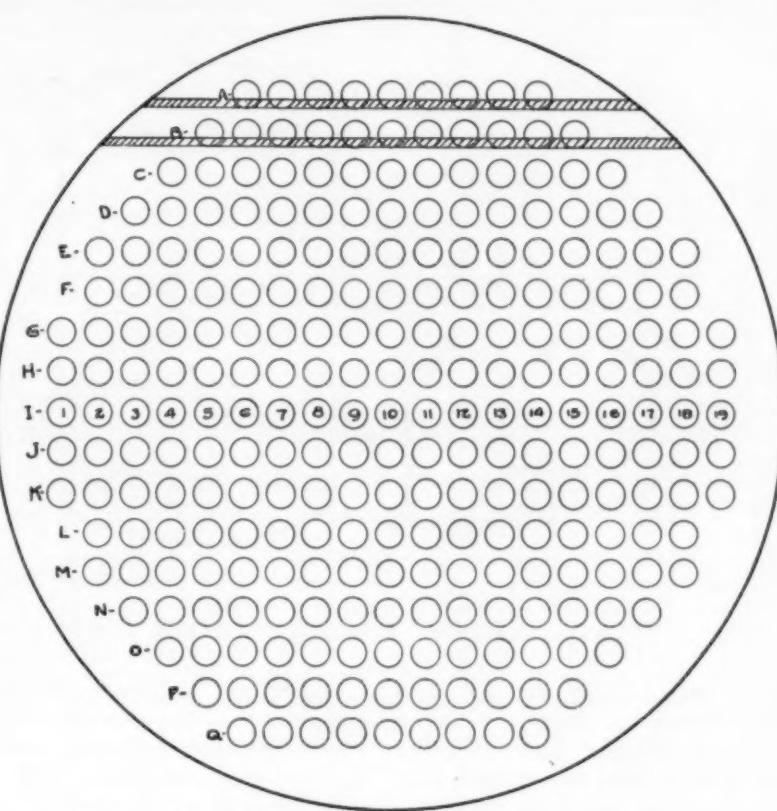


Fig. 5—Sketch of Tube-Sheet Used in Test

Tubes were 3 in. outside diameter and baffles were fitted to each row as shown above for rows A and B

if you tip one block the others fall down, differing, however, from the illustration in that both choking and opening the final liquor discharge chokes and opens each valve accord-

ingly, while picking up one block does not pick up the other blocks.

The ebullition area may be considered as the product of the diameter, tube length and number of tubes. Up to date we have been unable to observe any foaming even with the most foamy liquors. Instead of having a sufficient pressure on a preceding effect to raise the liquor to the height of the top level of tubes, we accomplish the same result, as well as the pressure necessary to operate the spray nozzles, by electrically driven pumps.

It will be seen that any scale in such an evaporator may be removed by surrounding the tubes with water and cracking off the scale by means of an acetylene flame.

This type of evaporator can be increased in capacity by taking apart the back flange, adding a section, and increasing the length of the tubes, which can be lengthened to the desired length by an electric welding machine.

#### DESIGN SELECTED

This article is not for the purpose of sponsoring any one type of evaporator and the writer has some hesitancy in showing the type used. But having laid down certain principles of evaporation, it becomes necessary to show at least one method by which

Table IV—Typical Results Obtained With Spraco Nozzle

3-in. supply-pipe.  
43 in. from nozzle-tip to tube-sheet.  
49 in. above floor of shell. Pressure, 20 lb. per sq.in.

Row	Tube	Gal. Per Minute	Row	Tube	Gal. Per Minute	Row	Tube	Gal. Per Minute	Row	Tube	Gal. Per Minute
A	6	0.357	F	16	0.600	K	1	0.455	Q	16	0.429
	8	0.273		18	1.152		3	0.469		5	
	10	0.294		G	1	1.071	5	0.750	7		
	12	0.326		3	0.682	7	0.939	9			
	14	0.682		5	0.790	9	0.790	11			
	5	0.500		7	0.682	11	0.833	13			
B	7	0.406		9	0.833	13	0.883	15			
	9	0.484		11	0.939	15	0.750				
	11	0.441		13	0.682	17	0.469				
	13	0.470		15	0.750	19	0.517				
	15	0.750		17	0.750	2	0.455				
	4	1.000		19	0.750	4	0.484				
C	6	0.577	H	1	1.500	L	6	0.883	Q	Slow delivery	
	8	0.652		3	0.682		8	0.883			
	10	0.652		5	0.883		10	1.000			
	12	0.682		7	0.883		12	0.883			
	14	0.625		9	1.250		14	0.682			
	16	1.152		11	1.152		16	0.484			
D	3	1.000		13	0.790		18	0.715			
	5	0.600		15	0.683		2	0.300			
	7	0.600		17	0.750		4	0.319			
	9	0.652		19	1.152		6	0.625			
	11	0.682		I	1	1.364	8	0.833			
	13	0.715		3	0.555	10	0.883				
E	15	0.652		5	0.833	12	0.883				
	17	1.500		7	0.883	14	0.682				
	2	1.000		9	1.250	16	0.406				
	4	0.577		11	1.250	18	0.600				
	6	0.682		13	0.939	3	0.231				
	8	0.600		15	0.790	5	0.250				
F	10	0.555		17	0.625	7	0.417				
	12	0.750		19	0.833	9	0.535				
	14	0.750		I	1	1.152	11	0.517			
	16	0.682		3	0.500	13	0.375				
	18	1.364		5	0.833	15	0.221				
	2	1.152		7	0.883	17	0.273				
G	4	0.652		9	0.883	4	0.417				
	6	0.625		11	0.883	6	0.250				
	8	0.517		13	0.883	8	0.278				
	10	0.600		15	0.883	10	0.283				
	12	0.652		17	0.469	12	0.268				
	14	0.625		19	1.071	14	0.208				

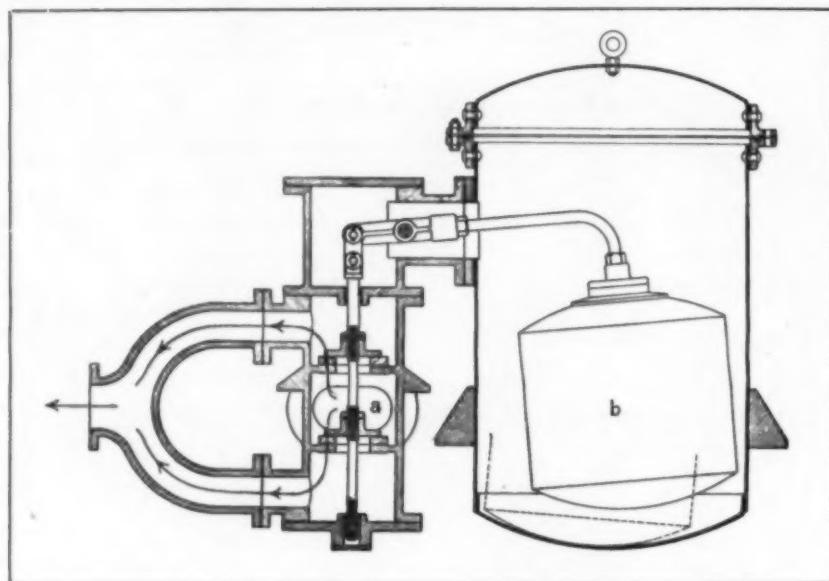


Fig. 6—Specially Designed Float Valve  
Arrows show course of liquor at a. b = float.

these principles can be put into actual practice. A working drawing at a greatly reduced scale, in order that a general idea of the type may be obtained, is therefore shown in Fig. 7. The gill flanges are not shown on this though two are indicated. Fig. 1, however, shows these gill flanges and so their absence is not material.

In relation to the special float valve shown in Fig. 6, it will be observed that by putting the disks or seats *a* below the partitions *b*, the drop of the float will close the valve instead of open it as shown in the chart.

If the liquor to be evaporated is of such a nature as to make it impossible to take out a 50 per cent liquor from the vacuum effect, and

comes to the evaporator at a high temperature, the greatest efficiency will be obtained by passing the liquor through an exchanger and then entering it in an intermediate effect. The effect which it enters is determined by the temperature of the liquor after it has passed through the exchanger. The liquor is then passed in forward or parallel flow evaporation and after emerging from the last effect is passed through the exchanger above mentioned, entering the next preceding effect to the one which reserved the weakest liquor and submitted to backward or counter-current evaporation. By this means the concentrated liquor may emerge from the hottest evaporator at a temperature at which the vis-

cosity is so reduced as to obviate the difficulties encountered in forward flow evaporation.

There are many combinations in the sequence of evaporation, which I shall not go into here, or this paper would be unduly long.

In conclusion, the author wishes to acknowledge his indebtedness to Carl Gunzel for his help in the preparation of the charts and his most efficient work in superintending the experiments from which the data have been obtained, also to John Graff for the photographs.

#### Correction

In the Jan. 14, 1924, issue of *Chem. & Met.*, pages 56 to 59, an article on "Flow of Water in Short Pipes," by Prof. O. W. Boston of the University of Michigan, appeared. Since publication, Professor Boston has sent us certain corrections which he desires made.

These follow:

(1) In Table I, under  $\frac{dH}{dt}$ , first four items should have minus sign preceding.

(2) In Fig. 4, the ordinates are negative—i.e., preceded by minus sign.

(3) In equation 1, first term on right should have an additional 0 inserted in coefficient directly after the decimal point.

(4) In equation 2, a similar correction should be made to coefficient of first term on right.

(5) In equation 3, left-hand term should read  $\left(\frac{dH}{dt}\right)^*$

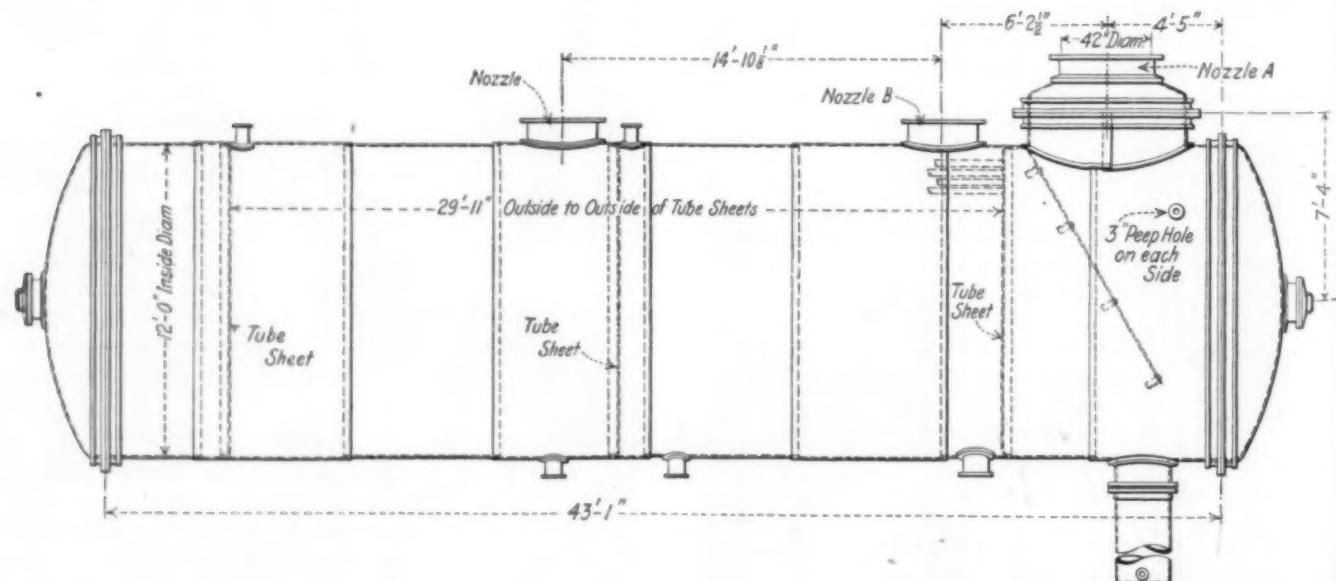


Fig. 7—Working Drawing Showing General Type of Evaporator Designed

# Equipment News

*From Maker and User*

## Radiant Heating System

### Furnace Construction Which the Varnish Industry Uses Is Applicable in Other Industries

One of the aims in any industrial heating process must be to cut down the amount of heat loss. Where the heating is accomplished by the direct combustion of a fuel, it is usual for about 75 per cent of the heat generated to be lost in the waste gases. Consequently the operators of such an industry are interested in anything that will aid them to further fuel economy. It is for this reason that the system outlined below—so far applied in varnish making only—will prove to be of wide general interest.

The Gilbert fuel system for varnish tins can be applied either with oil or gas as the fuel. The Graff Engineering Corporation, of 150 Nassau St., New York City, which controls this system, recommends oil in most cases—for it is only under particularly favorable circumstances that it is found that gas can compete as to price, and oil will, in this design of furnace, accomplish all that gas can.

In Fig. 1 is shown a sectional plan of a typical Gilbert varnish furnace. The inner lining, shown by the broken line hatching, is made of some monolithic refractory material, in this case with a special grade of "Plibrico" made by the Jointless Firebrick Co. of Chicago, Ill. Surrounding this is a layer of Sil-O-Cel insulation and the outside setting is of concrete or other suitable material.

The circular end of the furnace is crowned by an arch, as shown in Fig. 2, which is perforated with numerous circular openings. At the other end of the furnace tunnel is located a combustion block, where the fuel combus-

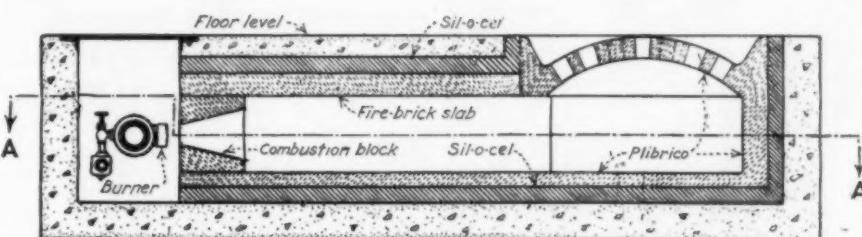


Fig. 2—Sectional Elevation of Radiant Heat Furnace

tion occurs and directly beyond which is situated the burner.

For the preferred type—oil burning—an Anthony burner of the mechanical type is used. This is supplied with oil at a high pressure depending on circumstances and with air at low pressure. Oil is pumped by a Goulds triplex pump and air is supplied by a Sturtevant blower.

A needle valve on the oil line and a blast gate on the air line are set when the furnace is first put into operation to give the proper proportion of air to oil to suit the dimensions of the particular furnace. These valves are then locked and subsequent adjustment incident to furnace operation and control is done, either automatically or by hand, in a manner that maintains this fixed relation. Of course, if the fuel is changed, the relation of air to oil can be changed with it.

The stream of atomized oil and air is introduced by the burner into the combustion block, where combustion takes place. The hot gases heat the monolithic lining of the tunnel—the length of which is varied to suit the conditions of the installation—and combustion is completed before they pass out. The total heat of these gases is practically all extracted in the circular chamber, and it is the radiant energy from the walls of this chamber

that serves to heat the varnish kettle, which sets directly over the arch.

Other applications of this system, which is the patented invention of Harry E. Gilbert, are in the process of being worked out, so that the system can be applied to other industries.

## Friction-Driven Packer

A new friction-driven packer that is automatic is adapted to a wide range of work, for it will handle any material, pulverized, granular or fibrous, that can be compressed into a container.

A heavy maple frame is assembled to form a solid unyielding unit. A one-piece webbed casting of sufficient strength carries all four bearings, having extra long journals cast integral with the iron front, thus insuring rigidity and alignment of the two shafts, besides preventing undue wear of the bevel gears. The friction clutch is of the simple cone type, faced with thermoid and bronze bushed. This combination makes a drive that releases instantly and engages gently. A full complement of compression grease cups provides for lubrication of shaft bearings and friction clutch and the special auger equipment packs evenly and quickly without undue friction. The carriage that supports the barrel or other package is suspended by heavy steel chains passing over sleeves of large diameter, and to eliminate unnecessary friction is provided with rollers which run on steel guides. The device used for raising the platform consists of a non-stretchable belt rolling over a double flanged pulley and connected with a heavy weight.

A uniform weight in each barrel or sack is made possible by an adjustment attached to the brake-lever. By moving a weight, more or less material as desired can be compressed into the package. The attendant puts on the empty sack or barrel and takes off the filled packages. The empty barrel is placed on the platform and the latter ascends to its proper position by raising a lever. The friction clutch is then thrown into contact by pushing a second lever; packing now begins. The platform gradually recedes with the accumulating weight in the package and as soon as the latter is filled an

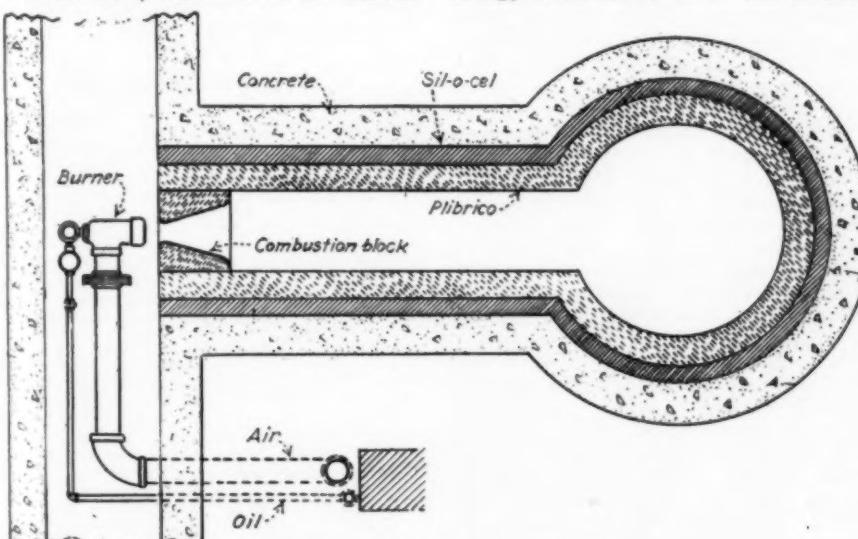
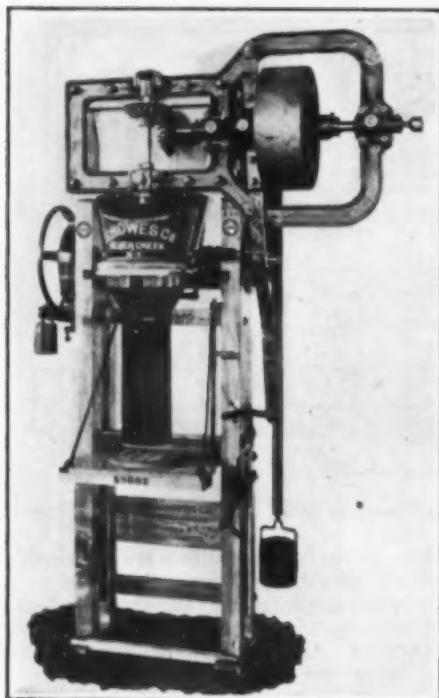


Fig. 1—Sectional Plan of Radiant Heat Furnace



Automatic Package Filling Machine

adjustable trip disengages the clutch, shuts off the power and the platform descends to the floor. The filled package is then ready for removal. The height of the packer is 9 ft. 8 $\frac{1}{2}$  in. It is made by the S. Howes Co., Inc., Silver Creek, N. Y.

### Refinery Oil Burner

**Device for Petroleum Refiners Gives Good Results With Kilns and Furnaces**

A new oil burner, called the Quinn PGS Burner, has been placed on the market recently by the Combustion Engineering Corporation, of 43 Broad St., New York City. This burner has been designed especially to meet the requirements of oil-refinery work. The inventor has an intimate knowledge of refinery conditions and took these into account in making this design. However, the burner can be used equally well with steam boilers, stills, kilns and various types of industrial furnaces.

The name, PGS, indicates pressure—gravity—siphon. This means that the burner utilizes the siphon principle and that the oil may be fed to it by pressure or gravity. From the refinery standpoint, an advantage is claimed in the ability of the burner to burn low grades of oil and tar containing considerable sediment. This is in part due to the fact that the fuel never has to pass through an opening less than 1 in. in diameter, thus eliminating clogging. Another feature is the ability to maintain a uniform temperature. Where acid sludge or other fuel that might damage ordinary metals is used, the burner is supplied in special metal to fit the case.

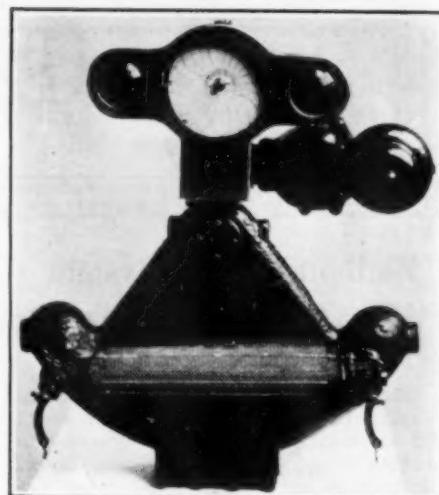
Ordinarily, this burner is made of brass throughout, except for the standard wrought-iron pipe connections. As shown on the accompanying line drawing, the steam enters through an upper

pipe and the oil through the lower. In the mixing chamber the oil rises to about the base of the cup. As a result of the whirling motion given to the steam, which expands over the curved surfaces, the oil and steam become mixed and fill the entire chamber.

The mixing chamber serves as a reservoir and tends to prevent sudden changes in the flame size due to fluctuations in oil steam pressure. The oil may be fed by pressure or gravity. Steam pressures of from 20 lb. per sq.in. up are employed. A bypass permits the oil line to be cleaned with steam. If steam is not available, compressed air may be used for atomization with good results. With steam, the consumption is around 6 lb. of oil atomized per pound of steam used. The burners are made in the following sizes:

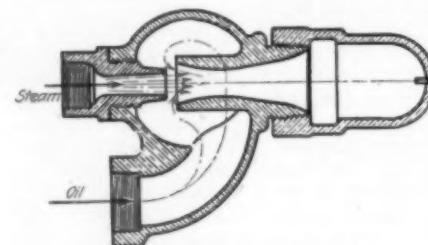
**No. 1 Burner**—The capacity of this burner is from 30 to 120 gal. of oil per hour and it may be installed under boilers from 100 to 400 hp. It is recommended for boilers, end-fired stills and large furnaces.

**No. 2 Burner**—The capacity of this burner is from 10 to 60 gal. of oil per hour and it may be installed under boilers from 35 to 200 hp. It is recommended for boilers, side-fired stills,



Water-Level Recorder

These drums are made in 10, 15, 30, 50 and 55 gal. sizes with 9-in. openings, in 30, 50 and 55 gal. sizes with 12-in. openings, and in 50 and 55 gal. sizes with 15-in. openings. Two-inch and 1 $\frac{1}{2}$ -in. openings for pump connection are supplied if desired.



Oil Burner Mixing Chamber

re-run stills, high pressure stills and cracking coils.

**No. 3 Burner**—The capacity of this burner is from 1 to 10 gal. of oil per hour. It is recommended for small furnaces, acid plants, sugar refineries, chemical plants, char kilns, etc.

### Drums With Covers

For shipping powders, crystals, heavy greases and lubricants, lightweight steel drums have had extensive use. A new package of this type is being offered by the Detroit Range Boiler & Steel Barrel Co., Detroit, Mich., which, it is claimed, gives numerous advantages over the friction top type.

This drum is designed with a removable cover, held in place with patented steel clips and sealed with a gasket. While not designed for shipping liquids, it is said to be so tight as to hold gasoline without leakage. The cover is easily removed or affixed with a wrench. Distortion of the head or cover is eliminated, so that it can be opened or closed as many times as necessary.

The clips are securely riveted and are reinforced on the inside with large washers. There are no loose bolts, rings or other parts to become lost. Each clip is drilled for a wire, so that drums can be sealed while in transit. At the edge of the closure the drum head is turned out, which makes cleaning easy and prevents seepage when exposed to rain water.

### Water-Level Signal

A new recording device recently placed on the market keeps a constant check on water level in boilers. The instrument makes a written record of the height of the water in the boiler throughout the 24 hours, and in addition rings a bell whenever the level is either too high or too low. A mechanically operated pen draws a red-ink line on a circular clock-driven chart, and this record indicates graphically important facts that need to be known regarding the care the boiler is receiving. The red line also shows the exact time when the boiler was "cut in" and "cut out," when it was banked for the night, when it was "blown off," and when in operation. Foam in the boiler actuates the bell signal in the same way as would low water, and the ringing will continue until this undesirable condition is corrected. The water gage is illuminated sufficiently to make its markings visible 50 ft. away. This device is made by W. C. Hackman, 224 Plankinton Arcade, Milwaukee, Wis.

### Catalogs Received

H. S. B. W. COCHRANE CORPORATION, Philadelphia, Pa.—Pub. 1195. "The Treatment of Boiler Feed Water for Highly Overloaded Boilers," by David Henderson, engineer, the Dravo-Doyle Co., Pittsburgh, Pa. This pamphlet considers the softening of waters at boiling point, considering means of reducing the foaming and priming tendency.

SULLIVAN MACHINERY CO., Chicago, Ill.—Bulletin 77-I. A catalog describing the portable mine-car air compressors which this concern builds and mounts on a special mine car.

DIAMOND ALKALI CO., Pittsburgh, Pa.—The Diamond Alkali Handbook, a book of useful information of alkalis in general and this company's products in particular.

SULLIVAN MACHINERY CO., Chicago, Ill.—Bulletin 81-D. A catalog on Sullivan type "DB-221" compressed air concrete breakers.

STEER ENGINEERING CO., Detroit, Mich.—Pamphlet 256: A leaflet on steel pipe and fittings for gas, water, steam and air.

SULLIVAN MACHINERY CO., Chicago, Ill.—Bulletin 77-J. Catalog describing various types of portable air compressors—gasoline engine, electric motor and belt-driven types.

## Review of Recent Patents

### Some New Suggestions for Coal Carbonizing Methods

#### In Addition to the Orthodox High-Temperature Coking Systems, Other Coal Distillation Equipment Is Being Patented

POWDERED coal has been prominent of late in the eyes of the engineering world. One of the newest developments in this field is the method of coking powdered coal invented by Walter E. Trent (assigned to Trent Process Corporation, Dec. 25, 1923, 1,478,864). In this invention the volatile matter is first distilled off from the coal particles and the resulting non-gaseous material is deposited in a hot, viscous condition upon a collecting surface, where it adheres and accumulates to form coke.

In this method the comminuted coal is introduced under velocity to a treatment chamber maintained at a temperature sufficient to bring about combustion of some of the distilled gases of the coal when supplied with the required air, thereby producing the necessary heat and temperature properly to distill the volatile content from the coal particles on entering the treatment chamber. When comminuted coal is subjected to distillation, toward the end of the heat-treatment, when all or

nearly all of its volatile content has been expelled, the non-gaseous residue becomes sticky and viscous for a short period, rendering it capable of adhering to a surface when projected against the same in this condition. If this stage has not been reached before the particles come in contact with the collecting surface, they will adhere to the viscous surface already formed and shortly thereafter become viscous themselves, the entire mass gradually becoming coke in a solid state.

The density or compactness of the solid coke depends in part upon the velocity under which the particles are projected against the collecting surface, the greater the velocity, other conditions being equal, the more dense will be the mass of coke. The invention, therefore, not only contemplates making mass coke from carbonaceous particles but making cokes of different densities according to varying requirements.

As the comminuted coal is introduced to the treatment chamber the volatile

products are rapidly distilled and the carbon particles accumulate upon the surface of the chamber, agglomerating or building up in layers because of the sticky condition of the particles, the distilled products being discharged and collected. The comminuted coal or material to be coked may be fed dry, or mixed with a liquid. The coal, whether fed in a dry state or suspended in oil or other liquid, may be entrained and introduced to the treatment chamber with the air required to support partial combustion. During the period of coke formation, the distilled gases, vaporized oils and products of combustion are continuously discharged from the treatment chamber and may be treated for the recovery of the distilled products.

#### Distilling Non-Coking Coals

In the course of the development of low-temperature carbonizing methods, much attention has been given to the use of non-coking bituminous coals. One of the latest steps in this direction is described in a recent patent granted to Heinrich Koppers (1,480,271, Jan. 8, 1924). In this method, distillation takes place in long rectangular chambers like coke ovens, separated by heating flues. On the long sides of these chambers are arranged plates which abut against the front walls of the chambers. The fresh material is fed from above and flows down over these plates, the residue, or low-temperature coke, being drawn off at the bottom. Means are provided for stirring the material on each plate from the front of the oven automati-

#### American Patents Issued February 5, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.*'s staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,482,386—Process for Manufacturing Artificial-Silk Threads or Other Cellulose Fibers. Leroy Smith Converse, Wilmington, Del., assignor to Atlas Powder Co., Wilmington.

1,482,389—Process of and Mixture for Making Glass. Alexander L. Duval D'Adrian, Washington, Pa.

1,482,408—Absorption Device. Emil Piron, New York, N. Y., assignor to Piron Coal Distillation Systems, Inc., New York.

1,482,414—Process of Manufacturing Anti-Friction Bearings and Compounds. Carl Schmidt, Berlin-Tegel, Germany, assignor of two-thirds to Sparlager G. m. b. H., Berlin, Germany, a Corporation of Germany, and one-third to Marburg Brothers, Inc., New York, N. Y.

1,482,418—Centrifugal Machine. Chester E. Unger, Goshen, Ind., assignor to Industrial Products Co., Goshen.

1,482,438—Process of Converting Oils. Almer McD. McAfee, Port Arthur, Tex., assignor to Gulf Refining Co., Pittsburgh, Pa.

1,482,479—Manufacture of Non-Hygroscopic Fertilizer. Alwin Mittasch and Carl Kircher, Ludwigshafen-on-the-Rhine, Germany, assignors by mesne assignments to Badische Anilin & Soda Fabrik, Ludwigshafen-on-the-Rhine.

1,482,483—Process of Refining Oils. Arthur Stanley Quick, London, England.

1,482,514—Process for the Commercial Preparation of Aminophenylarsenic Acids. Maurice Guerin, Paris, France.

1,482,563—Superhardened Steel and Process for Producing the Same. Axel Gustaf Emanuel Hultgren, Gottenborg, Sweden.

1,482,585—Method of Decarbonizing Ferro-Alloys. Hugh C. Sicard, Niagara Falls, N. Y., assignor to United States Ferro Alloys Corporation, New York, N. Y.

1,482,601—Method of Making Water-Softening Material. Svein Dahl-Rode, Brooklyn, N. Y.

1,482,607—Agitation Separator. Alexander M. Gow, Duluth, Minn.; American Exchange National Bank of Duluth, executor of said Alexander M. Gow, deceased.

1,482,624—Drying Machine. Pascal J. Shampay, Chicago, Ill.

1,482,684—Sublimator. Julius Hortvet, Minneapolis, Minn.

1,482,730—Refrigerating System. Robert A. Burford, Jr., Birmingham, Ala.

1,482,740—Catalyzer and Process of Making Same. Carleton Ellis, Montclair, N. J.

1,482,792—Process of Treating the Surfaces of Crystalline Mineral Materials. Miner L. Hartman, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls.

1,482,793—Process for Treating Surfaces of Crystalline Mineral Material. Miner L. Hartmann, Niagara Falls, N. Y., assignor to the Carborundum Co., Niagara Falls.

1,482,795—Vomiting Kier. Eugene D. Jefferson, Boston, Mass.

1,482,804—Art of Manufacturing Isopropyl Ether. Matthew D. Mann, Jr., Roselle, N. J., assignor to Seth B. Hunt, trustee, Mount Kisco, N. Y.

1,482,812—Apparatus for Drying

Divided Materials. William E. Roberts, Lompoc, Calif.

1,482,818—Method and Apparatus for Welding. William P. Shipman, Pittsburgh, Pa., assignor to Blaw-Knox Co., Pittsburgh.

1,483,825—Apparatus for Treatment of Waste Paper. John Stevens, 3d, Boston, Mass., assignor to Arthur D. Little, Inc., Cambridge, Mass.

1,482,839—Process of Purifying Crude Synthetic Camphor. Johannes M. Kessler, West Orange, N. J., assignor to E. I. du Pont de Nemours & Co., Wilmington, Del.

1,482,919—Process of Making Resinous Materials. Carleton Ellis, Montclair, and Harry M. Weber, Bloomfield, N. J., assignors to Ellis-Foster Co.

1,482,929—Ketonic Resin and Process of Making Same. Trevor S. Huxham, Bloomfield, N. J., assignor by mesne assignments to Carleton Ellis, Montclair, N. J.

1,482,933—Method of Treating Natural-Gas Gasoline and of Making Gas Therefrom. Arthur N. Kerr, Bellevue, Pa.

1,482,939—Process of Making Carbon. James McIntosh, Norristown, Pa., assignor to Diamond State Fiber Co., Elsmere, Del.

1,482,998—Agitating Apparatus. James W. Kent, Brooklyn, N. Y., assignor to Kent Machine Works, Inc., Brooklyn.

1,483,048—Apparatus for Measuring and Mixing Materials. Thomas J. Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Co., Boston, Mass.

1,483,062—Metal-Working Furnace. Oswald S. Pulliam, New York, N. Y., assignor to Hibbard Process Corporation, New York.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

cally and continuously. This insures the continuous downward movement of the coal and also opens passages for the volatiles to escape upward through.

In heating, combustion takes place outside the oven walls and the hot gases only are circulated downward in the heating walls, thus eliminating temperature peaks and insuring the best conditions for heat transfer.

#### *Producing Gas in Rotary Retorts*

An unusual type of gas producer is embodied in a recent patent of Ernest L. Broome (assigned to General Reduction Gas & By-Products Co., Jan. 8, 1924, 1,480,148). This consists of a

rotating, horizontal retort, resembling closely in appearance the conical pebble mill. This retort has a screw feed and a gravity discharge. It is lined with refractory material and gas is collected off the discharge end.

Combustion takes place, as generally with producers, within the chamber wherein the material to be gasified is placed. A tuyere, arranged to enable gas or air or both to be fed to the retort as desired, is so constructed that it opens into the fuel bed directly. This tuyere has numerous openings into the retort at the point of greatest diameter. It is arranged to revolve with the retort and has a gland to prevent leakage.

## Developments in the Byproduct Coke-Oven Field

### Attempts to Overcome Some of the Difficulties of Operation Mark the Activities of Inventors of Coke Ovens

THE distribution of heat along the heating wall of a coke oven has occupied the attention of designers of ovens since the beginning of the art of byproduct production. An effort of this nature is noted in a recent patent of Arthur Roberts (1,475,881, assigned to the Chicago Trust Co., Nov. 27, 1923). This patent concerns the familiar type of Roberts oven, in which the heating gases travel downward in the heating flues from a point near the top of the oven toward the oven sole. Its object is to provide a means of heating the lower part of the oven wall to the same degree that the upper part is heated, thus giving the coke even heating all along the oven wall. Another aim is to obtain sufficient control of the heating to enable the proper difference in heat to be maintained between the pusher end of the oven and the coke end.

In the Roberts oven, to which this patent applies, the flame path is downward, each oven being supplied with many burners, combustion commencing near the oven top and the spent gases being withdrawn near the bottom of the oven, passing then through a regenerator. Instead of using straight flues to form the gas passages, the heating flue is made up of several stacks of interconnecting passages which cause the gas to take a zigzag path. This use of several stacks instead of an open heating flue, as in the older type of Roberts construction, is one of the improvements, as it permits more heat to be applied to the zone at one end than to that at the other.

In addition to the regular burner, as used in the familiar type Roberts oven, the new patent contemplates the introduction of a subsidiary flame by a row of burners located part way down the heating flue, thus tending to give the sole of the oven a heat equal to that at the top.

#### *Other Improvements in Roberts Ovens*

In addition to the patent discussed above, Thomas G. Kus has recently obtained another patent relating to the Roberts oven (1,478,570, assigned to the Chicago Trust Co., Chicago, Ill., Dec. 25,

1923). This invention also has for its object a control of the heat distribution to the oven. It uses the usual type of Roberts heating flue construction in which the burning gases from several burners are free to mingle in the zigzag passages of the flue, there only being several main divisions of this flue. In this patent it is proposed to use burners at the top of the heating flues, burners at the bottom of these flues and supplemental burners located about half way between.

#### *Heating the Sole of a Coke Oven*

A number of attempts have been made to achieve even heat distribution in coke ovens by heating the bottoms or soles of such ovens. A recent attempt along this line is represented in a recent patent to Theodor von Bauer and Bernhard Zwillinger (1,478,410, Dec. 25, 1923).

This oven is wide and low, being particularly designed for the carbonizing

of coals not usable in the ordinary by-product recovery coke oven. It is also of simpler design than the usual type. It provides for preheating the air for combustion to a high degree. Provision is also made for a more intense heat at the doors than elsewhere and for a change to non-recovery heating if desired.

The oven, as stated above, is low and broad. Its floor is underlaid with heating flues. Heating flues are also situated in the side walls of the oven, in particular at the ends. Combustion takes place below the floor flues. Hot gases rise up through the floor flues and wall flues. There is also auxiliary combustion provided in the flues near the oven ends to give extra heat at this point.

## Book Reviews

### *Economics of Overhead*

THE ECONOMICS OF OVERHEAD COSTS. By John Maurice Clark. 502 pages. The University of Chicago Press, Chicago. Price, \$4.

The prospective reader of this book should receive both a warning and an exhortation. He should be warned lest he approach the book under a misapprehension regarding its scope and content. But he should be encouraged and urged to study the book for many reasons, including the good of his intellectual soul and the future of industrial civilization.

The warning is this: The book is no manual of cost accounting, as might be implied from the title. The word "economics" has come to be so profanely used that such inferences are natural. It is with "economics" in its true sense that the author deals. He presents an interesting and brilliant analysis of the broad economic problem

## Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

CAUSE OF RED STAINS ON SHEET BRASS.—E. A. Bolton. Examination shows that presence of iron can be troublesome and that the influence of furnace conditions is sometimes harmful. *Iron Age*, Feb. 7, 1924, pp. 439-440.

RESEARCHES AFFECTING COPPER AND BRASS.—W. H. Bassett. How research, especially metallographic research, has revolutionized the industry. *Mining & Metallurgy*, February, 1924, pp. 73-75.

MANUFACTURE OF CONTACT SULPHURIC ACID.—H. Brady. This chapter of an extended series describes the different types of commercial absorbers—including Grillo-Schroeder, Badische, Tentelev, etc. *L'Industrie Chimique*, January, 1924, pp. 2-5.

COMPARISON OF VARIOUS PROCESSES FOR THE DIRECT SYNTHESIS OF AMMONIA.—P. Firmin. *L'Industrie Chimique*, January, 1924, pp. 6-10.

DEODORIZATION OF VEGETABLE OILS.—L. C. Whiton. A practical discussion of the technology of this process. *Cotton-Oil Press*, February, 1924, pp. 32-3.

L'ETAT ACTUEL DE L'INDUSTRIE DU PAPIER EN FRANCE.—R. Bouvier. A review of the situation among paper makers in France, with suggested remedies for the present critical state of this industry. *La Technique Moderne*, Jan. 15, 1924, pp. 38-44.

STRACHE DOUBLE GAS PROCESS FOR COMPLETE GASIFICATION.—Dr. Ernst Blau. A description of an Austrian process for obtaining complete gasification of coals which is somewhat like the American "backrun" process. *Gas Age Record*, Feb. 2, 1924, pp. 129-130.

SOME RELATIONS BETWEEN THE MICROSTRUCTURE OF METAL SURFACES AND ELECTRODEPOSITION MADE THEREON.—A. Kenneth Graham. Evidence of the influence of the structure of the base metal on electro-deposits. *Brass World*, January, 1924, pp. 3-7.

A SYMPOSIUM ON FERTILIZERS. An editorial treatment of this subject followed by several short articles. Some of the theories of the absorption of phosphates by plants are discussed. *Chemical Age*, (Lond.), Jan. 26, 1924, pp. 84-88.

of unused capacity, of idleness of productive resources.

The orthodox books dealing with the principles of economics commonly simplify the task by assuming freedom of competition, absence of economic friction and a generally static situation. Under these conditions, certain laws or principles are said to apply. Thus, for example, prices are said to tend to equal costs of production—other things remaining the same. This phrase about other things remaining the same is a refrain familiar to everyone who has ever read an economic text and lies at the root of much of the business man's aversion to "theoretical economists." As a practical man he knows that these other things do not remain the same and he therefore concludes that economic theory deals with a situation too artificial to be of interest to him. The fact is, of course, that largely because of the absence of full facts regarding business problems, the economists have been wont to underestimate the importance of disturbing, dynamic factors. Instead of writing the phrase "other things remaining the same," the modern economist is inclined to nose about the factory and the market place in an effort to find out whether these other things which do not remain the same are not worthy of as much space in his text books as the orthodox analysis which now occupies the entire volume.

The significance of the Clark book is this—it is a pioneer attempt to study economic phenomena not as they are assumed to be in his own little economic heaven but as they are in this vale of tears. The material he seeks to dissect, analyze and classify is the material that streams across the desk of the business executive. Instead of directing his entire attention to the declining marginal utility of the theoretical buns being devoured successively by the theoretically glutinous child, he discusses balance sheets and methods of distributing overhead costs. It is a book that will tend to make practical business men more theoretical and economic theorists more practical—ends much to be desired. R. M. HAIG.

## Books Received

### *Metallurgy of Iron*

LEHRDUCH DER EISENHÜTENKUNDE: Vol. I. Roheisenerzeugung (Pig-Iron Production). By Dr. Ing. Bernhard Osann. Second revised and enlarged edition, 923 pages, 535 illustrations. Wilhelm Engelmann, Leipzig, Germany. Price: paper cover, 29 gold marks; bound in cloth, 32 gold marks.

In this edition, Dr. Osann has greatly improved his well-known text on pig-iron production and has brought it up to date. Because of its thoroughness it will be of value to all interested in blast-furnace work and in addition its consideration of modern continental practice will prove of particular interest to those who wish to keep in touch with developments abroad. The treatment is built around the following outline: Raw materials; construction of blast-furnace plants; blast supply; material handling, charging devices and equip-

ment for removing the blast-furnace gases; gas and heat economy; chemical, physical and thermal control of the blast furnace; operation of the furnace; other methods of producing pig iron.

### Reprints From Annual Tables

ENGINEERING AND METALLURGY. Compiled by L. Descoix. Preface by George K. Burgess. 154 pages. Price: paper, 30 francs; bound, 40 francs.

ELECTRICITY, MAGNETISM, CONDUCTIVITY OF ELECTROLYTES, ELECTROMOTIVE FORCES. Compiled by M. Boll, G. I. Higson, M. Malapert, R. E. Slade and G. V. Weisse. Preface by F. B. Jewett. 144 pages. Price: paper, 30 francs; bound, 40 francs.

COLLOIDS. Compiled by G. Rebiere. Preface by J. Duclaux. 10 pages. Price: paper, 6 francs; bound, 12 francs.

CRYSTALLOGRAPHY AND MINERALOGY. Compiled by L. J. Spencer. Preface by Sir Henry A. Miers. 65 pages. Price: paper, 15 francs; bound, 25 francs.

SPECTROSCOPY. Compiled by L. Brüninghaus. Preface by A. Fowler. 210 pages. Price: paper, 35 francs; bound, 45 francs.

RADIOACTIVITY. ELECTRONICS, IONIZATION OF GASES. Compiled by J. Saphores and F. Bourion. Preface by Sir E. Rutherford. 19 pages. Price: paper, 10 francs; bound, 18 francs.

These are reprints from Vol. IV of the Annual Tables of Constants and Numerical Data (Tables Annuelles de Constantes et Données Numériques), which volume covers the literature of the world for the years 1913 to 1916 inclusive. Each reprint contains all of the data on the subjects indicated which are given in Vol. IV.

Orders for any of these reprints should be sent directly to Dr. Charles Marie, 9 Rue de Bagneux, Paris 6, and should be accompanied by an international money order or a draft on Paris covering the price of the reprint as given above plus 2 francs for postage and packing on each order.

Members of the following organizations are entitled to a 50 per cent discount on the prices given above: National Academy of Sciences, Philosophical Society of Washington, American Philosophical Society, American Academy of Arts and Sciences, American Association for the Advancement of Science, American Institute of Chemical Engineers, American Institute of

Electrical Engineers, American Electrochemical Society, American Chemical Society, American Ceramic Society, American Society of Civil Engineers, American Society of Mechanical Engineers, American Society for Testing Materials, American Institute of Mining and Metallurgical Engineers.

### Electrochemistry of Non-Aqueous Solutions

ELEKTROCHEMIE NICHTWÄSSERIGER LÖSUNGEN. By Paul Walden. 515 pages. Johann Ambrosius Barth, Leipzig, Germany. Price: paper covers, 30 Swiss francs; bound, 35 Swiss francs.

This new work forms Vol. XIII of the "Handbuch der Angewandten Physikalischen Chemie," edited by Dr. Georg Bredig. It supplements admirably Foerster's well-known work on aqueous solutions and also in a measure Lorenz and Kaufler's work on the electrochemistry of fused salts, both of which are in this series. Dr. Walden has handled a complex, much-disputed subject in a particularly commendable manner.

### Distillation

EINFACHE UND FRAKTIONIERTE DESTILLATION IN THEORIE UND PRAXIS. By Dr. C. V. Rechenberg. 814 pages, illustrated. Schimmel & Co., Miltitz bei Leipzig, Germany. Price: paper, 17 gold marks; bound, 18 gold marks.

This work constitutes a most valuable treatise on distillation, as the subject is covered thoroughly from fundamental theory to the design and operation of plant equipment. The book is divided into three parts, the first of which covers the vaporization of simple substances and contains an extremely valuable collection of tables of vapor-pressure and boiling-point data. In the second part, which deals with mixtures and solutions, steam distillation receives particular attention. Application of principles to plant practice and also to laboratory procedure forms the third part.

### New Publications

NEW BUREAU OF MINES PUBLICATIONS: Bull. 212, Analytical Methods for Certain Metals, including cerium, thorium, molybdenum, tungsten, radium, uranium, vanadium, titanium and zirconium, by R. B. Moore and S. C. Lind, J. W. Marden, J. P. Bonardi, C. W. Davis and J. E. Conley; Bull. 223, An Investigation of Powdered Coal as Fuel for Power-Plant Boilers (Tests at Oneida Street Power Station, Milwaukee, Wis.) by Henry Kreislinger, John Blizard, C. E. Augustine and B. J. Cross; Tech. Paper 289, Change Houses in the Lake Superior Region, by Cleve E. Kindall; Tech. Paper 310, Recovery of Gasoline From Uncondensed Still Vapors, by D. B. Dow; Thirteenth Annual Report by the Director of the Bureau of Mines to the Secretary of the Interior for the fiscal year ended June 30, 1923.

NEW BUREAU OF STANDARDS PUBLICATION: Tech. Paper 241, A Comparison of the Deoxidation Effects of Titanium and Silicon on the Properties of Rail Steel, by George K. Burgess and G. Willard Quirk. Price 10c.

NEW U. S. DEPARTMENT OF AGRICULTURE BULLETINS: No. 1178, Bordeaux-Oil Emulsion, by John R. Winston; No. 1179, Investigations of the Manufacture of Phosphoric Acid by the Volatilization Process, by William H. Wagaman, Henry W. Eastwood and Thomas B. Turley; No. 1194, A Chemical and Structural Study of Mesquite, Carob and Honey Locust Beans, by G. P. Walton.

### Calendar

AMERICAN CHEMICAL SOCIETY, annual meeting, Washington, April 21 to 25.

AMERICAN CONCRETE INSTITUTE, annual meeting, Chicago, Feb. 25 to 28.

AMERICAN ELECTROCHEMICAL SOCIETY, Hotel Bellevue-Stratford, Philadelphia, April 24 to 26.

AMERICAN INSTITUTE OF CHEMICAL ENGINEERS, Denver, Colo., July 15 to 18.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, New York City, Feb. 18 to 21.

AMERICAN PAPER AND PULP ASSOCIATION, including T.A.P.P.I., Waldorf-Astoria, New York, April 7 to 11.

AMERICAN PHYSICAL SOCIETY, New York, Feb. 23.

PAPER INDUSTRIES EXPOSITION, New York, April 7 to 12.

SAFETY CONFERENCE, Engineering Section of the National Safety Council jointly with Chicago Safety Council and the Western Society of Engineers, Morrison Hotel, Chicago, Feb. 19.

# News of the Industry

## Summary of the Week

Geological Survey is granted appropriation of \$15,000 for survey of arsenic-bearing ores.

Preliminary report on domestic production of dyes in 1923 will be issued in April.

Bill is introduced in House of Representatives calling for import tax of 35c. per bbl. on crude petroleum.

Preliminary plans announced for Denver meeting of Institute of Chemical Engineers.

Minority report of House Military Affairs Committee compares Ford's offer for Muscle Shoals unfavorably with other offers.

Chemical Warfare Service reserve is organized in Washington.

Suggested that American chemical interests consider Russia as field for their products.

Arsenic reduction plant opened in California.

### Urges Need of Timber Research for Paper and Pulp Industry

Problems of the pulp and paper industry in finding sufficient wood as raw material to meet the growing demand for paper were considered by a conference of leading manufacturers held in Washington last week at the call of the secretary. These manufacturers were recently asked to serve as an advisory committee on the Department of Agriculture's program for research in forestry problems and in pulp and paper manufacture.

"The vast industrial growth of the past 75 years has drawn enormously on the accumulated forests of centuries," said Secretary Wallace in addressing the conference, "and this quick drain has caught the world wholly unprepared to handle intelligently the problem of forest renewal. In our own country we have been easily deceived by the vast supplies of wood and by the comfortable thought that anyway we can make up any deficit by imports. We have tolerated a most costly abuse of our forests.

"Perhaps the pulp and paper industry is the first that has been brought face to face with the uncompromising truth. It can no longer leave to chance the supplying of its raw material. It cannot easily follow, as the sawmill can follow, the retreating fringe of virgin forest. It cannot extract pulp wood from denuded and abandoned forests. It cannot rely on any known or probable substitute for the bulk of our paper. It cannot depend indefinitely on imports from foreign forests that are likewise dwindling under neglect and fierce competition. The supplying of pulp wood has become one of the outstanding problems of the paper industry.

"Basic to the whole program of future forest management is research—research in timber growing, research in timber utilization, and research in forest economics, including research in taxation."

### C.W.S. Reserve Organized in Washington

A unit of the Chemical Warfare Service reserve has been organized in Washington. General Fries delivered the address of the evening at the organization meeting. Captain Gorin of the Chemical Division of the Department of Commerce presided. Meetings are to be held monthly in the future. The officers will be elected at the March meeting.

One of the objectives of the Washington unit is to stimulate the organization of similar units in the principal chemical centers of the country.

### Sales Managers Association and Management Men Consolidate

The National Association of Sales Managers was consolidated on Feb. 8 with the Sales Executives' Division of the American Management Association, according to announcement just made by C. K. Woodbridge, president of Dictaphone Corporation and president of the National Association of Sales Managers. In making the announcement Mr. Woodbridge said: "I believe business men will appreciate the wisdom of this move, which immediately associates the members of the National Association of Sales Managers with the leadership which embraces all factors of business. It opens up an opportunity for organized sales management to co-operate with other factors in business administration to do great things for the advancement of business. It gives an opportunity to bring into proper relationship all the minds found in business in the solution of problems of sales management, which after all are just as much problems of manufacture and finance as of sales management."

### Arsenic Reduction Plant Opened in California

Arsenic ores are being reduced at Martinez, on San Francisco Bay, at the new plant of the Chipman Chemical Engineering Co. This is one of the first companies producing insecticides and like compounds to turn out its own arsenic. The plant is unique in the sense that arsenic from California and Nevada ores is the principal product rather than a byproduct. An output of 3,000 tons is expected in 1924.

The new plant consists of an initial installation comprising a crushing plant, McDougal seven-hearth roaster, and arsenic kitchens said to be the largest in the world. Almost immediately two supplementary roasters are to be installed. The ore is shipped in by rail at present and the cars unloaded directly into storage bins, from which it passes to crushers and rolls which reduce it to a small size suitable for the roaster to handle. The roaster is oil fired with automatic temperature control and the fumes pass directly into a dust chamber and thence into the kitchens. These latter have been arranged so that they can be cleared during operation, thus making it unnecessary to shut down the plant for the purpose of taking off the arsenic.

### North Carolina Planters Urged To Combat Boll Weevil

Members of the Department of Agriculture of North Carolina are adopting different plans to curtail boll weevil damage to cotton in that state. They are urging the farmers to plant early varieties of cotton. The use of better seed and better fertilizers also is requested. In addition to pointing out methods for bringing the crop to an early maturity, they recommend the use of poison to kill the weevils when they first put in an appearance early in the season.

## Military Affairs Committee Minority Vigorously Attacks Ford Offer

### Objects to Terms of His Proposal—Believes Fertilizer Production Clause Not Binding and Consideration Absurdly Low

**E**MPHATIC opposition to the McKenzie bill authorizing acceptance of Henry Ford's offer for Muscle Shoals has been lodged in a minority report of the members of the House Military Affairs Committee. This report is summarized by the statement:

"The thought of the minority submitting this report is that the Ford offer should be rejected or amended so as to make it compare favorably with other bids now on hand, first, by placing the power projects under the control of the federal water-power act to insure distribution of power; second, by leasing the projects for 50 years on terms which will insure a net annual return as great as other bids submitted; third, by leasing the nitrate plants for a nominal rental as long as he will guarantee their use for the manufacture of fertilizer or fertilizer compounds.

"If this is not done, then consideration and examination should be made of other offers now on hand or to be received, and acceptance made of whichever one makes the best return to the government, assures the production of cheap fertilizer for the farmer, and provides for the maintenance of the nitrate plants as a standby in case of war, in accordance with section 124 of the national defense act."

This report is signed by John M. Morin, Harry E. Hull, Harry C. Ransley, John Philip Hill, Louis A. Frothingham and J. Mayhew Wainwright.

Grave doubts are entertained by Mr. Wainwright as to the wisdom or expediency of relinquishing the absolute control of this great natural resource of water power to any private interest upon any terms. He says further: "I question whether Congress can ever arrive at a wise or satisfactory conclusion until the whole subject and all offers that have been or still can be adduced have been analyzed, considered and reported on by a select commission as proposed by the President in his message at the opening of this session of Congress."

#### Ford Offer Compared With Others

In making their report the minority compare the Ford offer in every detail with that of the Southern power companies. Without specifically indorsing the latter or either of the two other offers—i.e., that of the Union Carbide Co. or that of the Hooker interests—they point out that Ford's offer is unfair in comparison with the actual values of the properties concerned.

Asserting that under the bill as recommended by the majority Mr. Ford's company "would not be regulated as to rates, service or issuance of securities by the Federal Government or the Alabama Public Service Commission," the report states that "Mr. Ford proposed to pay \$5,000,000 for the following

properties: Nitrate plant No. 2, costing \$66,252,392.21; nitrate plant No. 1, costing \$12,887,941.31; Waco quarry, costing \$1,302,962.88, and cashing from the sale of the Gorgas plant \$3,472,487.25—a total of \$83,915,783.65."

Attack is made upon the passing statement in the Ford offer that 40,000 tons of nitrogen will be made into fertilizer by the cyanamide process annually. Nitrate plant No. 2 is equipped to fix nitrogen by this process, but it is shown that satisfactory production of fertilizer is impossible by the cyanamide process. "If he [Ford] has other plans, he has not indicated what they are. If he has sought the aid of modern expert experience, the record does not disclose it."

Expert testimony, it is alleged, has shown that cyanamide production would not benefit the farmers of the United States, because the costs would be higher than the costs of equivalent nitrogen from other and more modern sources. Moreover, the minority finding is that Ford need not produce fertilizer unless he so desires—thus the property and the advantages bestowed with them would become his without restriction.

One outstanding feature of the minority report is the consideration given the commercial development of nitrogen fixation and of economical fertilizer production.

"The Haber process is being utilized in the United States at a plant in Syracuse, N. Y., producing approximately 20 tons per day of ammonia. There is a smaller plant at Niagara Falls using a process partly developed at the nitrogen research laboratories of the government under Dr. Cottrell. Power is not used extensively with any of these, but all these processes can be combined with the use of hydro-electric power to great advantage, and by this means the cost of the product can be very substantially lowered. Other processes have been developed and are in commercial operation, notably the Casale process, the invention of a distinguished Italian; the Claude process, invented by a Frenchman; and the American process, already alluded to, which has been developed by Dr. A. T. Larson at the research laboratories of the United States under Dr. Cottrell. The result is that it is now known that by taking advantage of modern scientific accomplishments and adding the benefit of hydro-electric power, it is possible to make atmospheric nitrogen available for the use of agriculture at low costs."

In view of these facts the minority can find no justification for "inducing Mr. Ford with heavy subsidy in the form of power and property to engage in that profitable enterprise. The opportunity to make fertilizer at Muscle Shoals has been created primarily by the government through the construction of its war-time works and

secondarily by the genius of the men of science who have developed available processes."

Speaking of the other offers made, the minority definitely states:

"We do not recommend the acceptance of any of the proposals referred to. They are better than the offer of Mr. Ford. If it was ever worthy of consideration that Muscle Shoals should be given to Henry Ford for the sole and only reason that no other bidder had made a comprehensive offer, that consideration has forever been obliterated."

### News in Brief

**Spanish Metallurgical Syndicate Reported**—It is stated in a Reuter dispatch that a mining and metallurgical syndicate may shortly be established in Spain consisting of all or nearly all the foreign companies exploiting metal mines in Spain in agreement with great foreign metallurgical concerns.

**Fertilizer Production Resumed at Carteret, N. J.**—The American Agricultural Corporation, New York, is arranging for the immediate resumption of production at its Williams & Clark plant at Carteret, N. J., following a shut-down of a number of weeks duration. About fifty operatives will be employed for initial operations, and this working force gradually increased.

**N. J. Zinc Co. Founds Fellowship**—The board of directors, New Jersey Zinc Co., Palmerton, Pa., has voted a fund of \$15,000 to Lehigh University, Bethlehem, for the founding of the New Jersey Zinc Co. research fellowship in science and technology. The income from the amount will be paid to the holder of the fellowship, who must be a graduate student from the institution in some division of engineering or science.

**Would Use Carbon Bisulphide on Crabs**—In Dade County, Florida, the Biological Survey of the United States Department of Agriculture has been making successful use of carbon bisulphide in fighting land crabs. In heavily infested areas there were about 15,000 burrows to an acre and the loss in tomatoes alone in the county amounted to more than \$200,000. Ten drops of the chemical in each hole is sufficient to destroy the pest and a gallon will fumigate nearly 5,000 burrows.

**American Firm to Operate Canadian Alloy Plant**—The Penn-Seaboard Steel Corporation, Philadelphia, Pa., has concluded negotiations for the purchase of the Burrows Magnetic Steel Co. and the Burrowlite Nickel Steel Co., Ottawa, Ont., and plans for extensive operations with the new divisions. The first noted has developed an effective steel-testing process, while the Burrowlite company has perfected a nickel ore substance which is added to carbon steel in molten condition and said to produce an alloy steel of characteristics and physical properties not found in commercial steel. It is stated that the saving in cost of production through the use of the material averages up to \$15 and \$20 a ton.

## Washington News

### Appropriation Made for Survey of Arsenic-Bearing Ores

At the insistence of Senators from the cotton-growing states \$15,000 has been included in the Geological Survey's appropriations for the examination of arsenic-bearing ores. While it is admitted that such a survey can have no effect on the immediate situation, it is thought in view of the greatly increased importance of arsenic that there should be more information available as to the deposits of ores containing high percentages of arsenic.

In view of the fact that all authorities agree that the sales of white and crude arsenic will be greater this year than last an increasing amount of attention is being given to the problem of the use of material less highly refined than that now generally required. Information reaching the government departments, however, indicates that there is a trend toward the use of flue dust running particularly high in arsenic with much less resort to refining processes than formerly was the case. It also is noted that there now is less complaint as to impurities.

### Import Duty Requested on Crude Petroleum

A bill was introduced in the House last week by Representative Rosenblom of West Virginia, in which a duty of 35c. a bbl. is proposed on importations of crude petroleum and a duty of 25c. per bbl. on fuel oil. It is stated that previous attempts to place an import duty on oil were not successful because of belief that free entry would create a lower price level. The present bill is said to have been sponsored by reports that most of the oil imported into this country comes from sources owned or controlled by American interests and that this oil has no effect on market values.

### Chemical Interests Urged to Develop Russian Markets

Now that the United States has a large surplus of capital, a portion of it should be diverted to the development of American enterprises in foreign fields, is an opinion expressed in official quarters. In that connection, attention was called particularly to the absence of any effort on the part of American chemical interests to establish themselves in Russia. While there is no thought that anyone should undertake manufacturing enterprises in that country at present, attention was called to the great activity of the Germans and the British chemical interests in Russia. Sooner or later, Russia will find herself. Acting on that assumption, the British and the Germans are on the ground making their preparations for definite activities, once property rights again are recognized. If American interests await the coming of such a time before initiating their enterprises, they will find the plums in

the hands of the earlier comers, it was said.

While the remark was prompted by the Russian situation, it was pointed out that the British, who have not specialized on chemicals any more than have Americans, long since have been in a dominating position in respect to such important commodities as nitrate of soda, rubber, borax, fusel oil and a long list of others.

### Bureau of Mines Will Not Be Transferred, Hoover Believes

In the opinion of Commerce Secretary Hoover, no executive order transferring the Bureau of Mines or other technical bureau to his department will be issued pending the report of the joint committee on reorganization.

The committee is awaiting the printing of the hearings before attempting to discuss recommendations. Senator Harrison, one of the members of the committee, expresses the opinion that a portion of the program outlined by Walter Brown, chairman of the committee, will be recommended.

### Production of Oils and Fats in Last Quarter of 1923

The Department of Commerce announces that the factory production in the United States of fats and oils (exclusive of refined oils and derivatives) during the 3-months period ended Dec. 31, 1923, was as follows: Vegetable oils, 771,081,452 lb.; fish oils, 19,266,991 lb.; animal fats, 628,023,324 lb.; and grease, 101,832,480 lb.; a total of 1,520,204,247 lb. The production of refined oils during the period was as follows: Cottonseed 343,255,681 lb.; coconut, 54,052,948 lb.; peanut, 1,265,823 lb.; soya bean, 1,238,650 lb.; corn, 20,597,222 lb.; and palm-kernel, 153,987 lb. The quantity of crude oil used in the production of refined oils is included in the figures of crude consumed.

The data for the 3-months period appear in the following tabulation:

Production, Consumption and Stocks of Fats and Oils

Kind	Factory Operations for the Quarter Ended Dec. 31, 1923	Factory and Warehouse Stocks Dec. 31, 1923
	Production, (Lb.)	Consumption, (Lb.)
Cottonseed, crude	500,719,765	376,647,885
Cottonseed, refined	343,255,681	198,967,093
Peanut, crude	1,406,121	1,790,914
Coconut, or copra, crude	65,513,933	105,400,815
Corn, crude	27,723,963	26,210,617
Soya bean, crude	285,765	5,325,567
Sulphur oil, or olive foots		5,268,903
Palm-kernel, crude		946,334
Rapeseed		3,003,313
Linseed	165,559,777	87,060,633
Chinese wood		16,793,981
Chinese vegetable tallow		1,251,043
Castor		4,846,606
Palm		19,796,033
All other	624,114	1,761,959
Menhaden	15,805,628	19,841,527
Whale	376,500	9,577,282
Herring, including sardine	2,579,625	1,040,683
Tallow, inedible	98,231,649	127,807,178
Neat's-foot oil	2,144,367	1,461,824
Hydrogenated oils	66,278,800	78,315,824
Red oil	11,759,556	8,200,932
Stearic acid	7,572,305	2,035,846
Glycerin, crude, 80% basis	27,014,452	24,733,393

### Missouri Station Opens for Bureau of Mines

The Experiment Station Building, which was provided for by the Missouri State Legislature in 1920 to house the Mississippi Valley Experiment Station of the United States Bureau of Mines and the Missouri State Mining Experiment Station, has recently been completed at Rolla, Mo., on the campus of the Missouri School of Mines and Metallurgy.

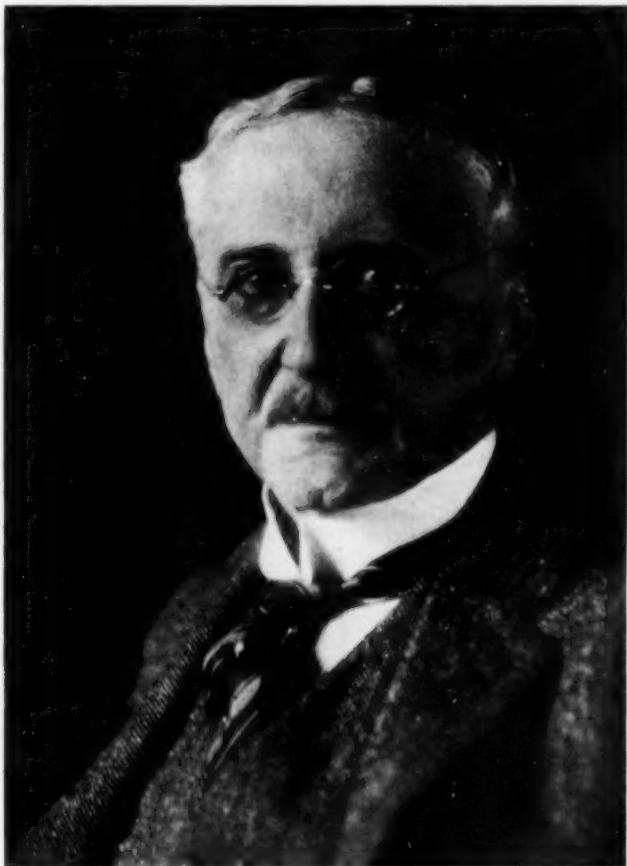
The building is H-shaped, there being a front wing in which are the offices and small laboratories, and a rear wing for heavy machinery and large-scale experimental work; the two wings are connected by a short passageway. The front wing contains three floors, one of which is a semi-basement. The top floor is assigned to the mining department of the School of Mines for class rooms and offices. The main floor is occupied by the Bureau of Mines; on that floor are a library and reading room, main office and several private offices, and two laboratories for experimental work on a small scale and refined research. In the semi-basement are an analytical laboratory shared by the Bureau of Mines and the State Experiment Station, offices for the staff of the State Experiment Station, and a laboratory for ore-dressing work with experimental equipment of small size.

### Lower Freight Rates Ordered on Colemanite

Lower rates on colemanite have been ordered by the Interstate Commerce Commission as a result of a complaint brought by the West End Chemical Co., a corporation engaged in the mining of colemanite and the selling of borax and boric acid. In the future the rate from certain Nevada producing points to San Francisco will be regarded as unreasonable if it exceeds 40.5c. per 100 lb. The report of the commission brought out that 95 per cent of refined borax is marketed in the East. There has been a change from eastbound to westbound in the movement of the commodity, due to that fact that the larger part of it now moves through the Panama Canal. There continues to be a substantial movement by rail to Eastern points, however, it was stated.

## Jacques Loeb

1859-1924



We in America are a paradoxical people. We lay much stress on freedom—freedom of thought, of opinion and of action—and yet we do not avail ourselves of it. We bind ourselves in with conventions. We are prone to say, "So and so, who knows, says this." We build our knowledge on text books. We accept and abide by assumptions that are out of date. We are afraid to think. So it is refreshing to have had contact with a man who had no regard for conventions if they did not stand on the substantial foundation of experimental fact. Such a man was Jacques Loeb.

The scientist and the technologist is apt to regard himself as that type of man, but until he encounters a Loeb he does not realize his shortcomings. This is often a provoking experience and frequently the resulting feeling is one of antagonism, especially if some pet convention has been shown to be either useless or wrong. This kind of antagonism Loeb experienced, for conventions were to him nothing sacred and his clear process of thought cut through them as a knife cuts butter. He was not afraid to think. Now Loeb is dead and the work of a great con-

structive thinker and of an ingenious, brilliant experimentalist is over.

Born in Germany 65 years ago and educated at a gymnasium in Berlin, he studied medicine in Berlin, Munich and Strassburg. Four years more he spent in Germany at universities and then went to Naples, where he began his studies that made him famous. He came to America in 1891, to Bryn Mawr first; then for 18 years he was professor of physiology at the Universities of Chicago and California. Finally, in 1910, he became head of the department of experimental physiology at the Rockefeller Institute of Medical Research. There he remained until his death on Feb. 12.

His great distinction was recognized in all parts of the civilized world, for he held degrees from Strassburg, Munich, Berlin, Cambridge, England; Leipzig, Geneva, and Yale. Many societies have honored him and themselves in so honoring him.

He will be most widely remembered for his work on biogenesis—especially artificial parthenogenesis—the generating of life without spermatazoa. It was work that he had been pursuing for years when an

inquisitive newspaper reporter seized the idea and broadcast it to the country under the dramatic title "Life Without Sex." Loeb himself did not want or encourage a popular understanding of his work. It was not disregard of the public, but a realization that the public was not interested in anything but finished work applicable and important to its daily life.

His work has had far-reaching effect not only in biology but in emphasizing the reasonableness of the mechanistic theory of life. It has become almost a part of the subconsciousness of scientific men and will have a profound influence on the thought of the race. It is impossible to realize that life has been generated artificially without having it make an ineradicable impression.

Still more recently Loeb had turned to more chemical subjects and in particular colloids. No matter what the ultimate consensus of opinion will be, there is no doubt that Loeb's work will have eliminated much loose thinking in this field and of necessity the air will be clearer, the objects more defined and research more productive.

## Men in the Profession

EUGENE BISSETT, heretofore manager of the Ashland, Wis., plant of the Charcoal Iron Co. of America, has been appointed to a like position at the Manistique, Mich., plant, succeeding T. C. Albin, who will be engaged in research and experimental work for the company. JOHN BROWN has been appointed manager of the laboratory at the Manistique plant.

JOHN A. CAMPBELL, president of the Trenton Potteries Co., Trenton, N. J., celebrated his twentieth anniversary as president of the Trenton Banking Co. on Feb. 7.

J. DONALD COTTRELL, formerly a sulphuric acid plant operator for the Pennsylvania Trojan Powder Co., is now a research helper with the New Jersey Zinc Co., at Bethlehem, Pa.

J. G. DELY, chief chemist of the Atmospheric Nitrogen Corporation, spoke before the Syracuse Section of the American Chemical Society, Feb. 15, on "The Chemist—His Education and His Job."

M. DONAUER has resigned from the position of chemical engineer of the Elyria Enameled Products Co. to become superintendent of the Robb Ross Co., Sioux City, Iowa, manufacturer of a varied line of food products.

Sir ARTHUR DUCKHAM, of the firm of the Woodhall-Duckham Co., London, England, is visiting in the United States on business affecting the further development of carbonization equipment in the United States and abroad.

Dr. PAUL D. FOOTE, physicist of the Bureau of Standards, Department of Commerce, Washington, D. C., spoke before the Franklin Institute, Feb. 14, on "Spectroscopy and Atomic Structure."

H. B. HILL, engineer in charge of the Bureau of Mines petroleum station at Salt Creek, Wyo., has been appointed deputy supervisor of the Gulf Coast district, succeeding WALTER H. SCOTT, who has been transferred to a similar position in the Rocky Mountain district.

F. M. HODGE has been elected president of the Kalamazoo Paper Co., Kalamazoo, Mich.

Dr. S. C. LIND, chief chemist of the Bureau of Mines, addressed the members of the George Washington University Chemical Society on the subject "Radium, Its Production and Uses," followed by an address by R. M. HAND of the Bureau of Chemistry on "Cobaltamines, Their Place in Modern Organic Chemistry," on Jan. 24, 1924.

H. H. MEYERS, senior industrial fellow, Mellon Institute, Pittsburgh, Pa., gave an address before students in the chemistry and engineering courses at the University of Pittsburgh, in the Fellows' room, Feb. 4, on the subject of "Fertilizers."

C. WILBUR MILLER, president of the Davison Chemical Co., Baltimore, Md., is recovering from a severe illness. He

has left the hospital and is now convalescing at his home in the Worthington Valley, Baltimore County.

LEROY H. MINTON, general superintendent of the General Ceramics Co., Metuchen, N. J., is a candidate for election as a member of the local Board of Education.

Dr. LUDWIG ROSENSTEIN, chief chemist for the Great Western Electrochemical Co., addressed the members of the California Section of the American Chemical Society on Feb. 1, the subject being "Ancient Japanese Metallurgy." Dr. ARTHUR LACHMAN, at the same meeting, discussed the researches which he and others have made on the Beckmann rearrangement.

F. W. WILLARD has been elected president of the Chicago Chemists Club to fill the vacancy caused by the resignation of A. V. MORY, who moved to New York to join the staff of the Bakelite Corporation.

## Obituary

EDWIN C. GOSHORN, general manager of the National Lead Co., New York, died in Cincinnati, Ohio, Feb. 7, at the age of 79 years.

EDWIN LUDLOW, president of the A.I.M.E. during 1921, died at Muskogee, Okla., on Feb. 10, 1924, after a brief illness. Mr. Ludlow was born at Oakdale, N. Y., in 1858, the son of William Handy and Louise Nicoll Ludlow. He was graduated from the Columbia School of Mines in the class of 1879, devoting his professional activities thereafter to coal mining, generally as an operating executive, being known in Pennsylvania, on account of his youth when assuming responsible executive positions, as the "baby superintendent." He was married to Anna Wright of Oklahoma on Nov. 22, 1893. After many years pioneer work in the West and in Mexico, Mr. Ludlow was in 1911 made vice-president and general manager of the New River Collieries Co., and a year later was chosen as vice-president of the Lehigh Coal & Navigation Co. and placed in charge of its mines. He remained with the Lehigh company until July 1, 1919, when he resigned to enter practice as a consulting engineer in New York City.

## Forest Products Instructs on Glue

The next course in gluing of wood, one of the instructional courses given at the Forest Products Laboratory, Madison, Wis., will be held April 7 to 12. Eleven men took this same course last December. Various industries represented in that class included two glue-manufacturing concerns, a cooperage company, a chemical plant, three sash and door factories, a flooring company, a cabinet-making establishment and a phonograph factory.

## New Pulp Mills Planned Near Quebec

It is announced that English interests, of which the Rothermere interests are said to be the principals, which recently successfully bid for a block of timber limits in the basin of the Manicougan River, Province of Quebec, will erect a pulp mill and later a newsprint mill a few miles from Quebec at an expenditure of \$16,000,000.

Concurrent with this report is the announcement that the St. Regis Paper Co. will build a mill in the same section near the parish of St. Augustin at an expenditure of \$4,000,000. The reported mills of the British interests will likely be located at the western end of the city, a short distance from the Quebec bridge. The larger part of the pulp manufactured, and later the newsprint, will be shipped to England.

## Dye Production Report Will Appear in April

The extent of dye production at domestic plants during 1923 soon will be made known. The great bulk of the replies to the Tariff Commission's production questionnaire has been received. The returns have come in more promptly than was the case a year ago. The main element of uncertainty as to the exact time the full total will be known is the fact that unusual difficulties surround the gathering of the last 10 per cent of the figures.

Last year the report was not issued until late in June. Final figures will be available much earlier this year, it is believed. This year a preliminary report will be issued early in April, showing the trend of figures then in hand.

## U. of P. Extends Laboratories

The building and grounds committee of the University of Pennsylvania, Philadelphia, Pa., has tentative plans under consideration for the erection of a new laboratory, for which a fund of \$1,000,000, has recently been secured. It will be 5-story, constructed as a T-shaped wing adjoining the present medical laboratory at Pine and 37th Sts. It is purposed to transfer to the new building the chemical laboratories in the Hare Laboratory at 36th and Spruce Sts., releasing space for additional classrooms and including the installation of considerable new laboratory apparatus. Plans will be sent out for bids at an early date.

## G.E. Starts New Student Course

An advanced course in engineering, intended primarily to give special training to men who have exceptional qualifications for designing engineering work, has been established for student engineers in the employ of the General Electric Co., according to a recent statement by F. C. Pratt, vice-president. The course will be under the direction of R. E. Doherty, a consulting engineer of the company, assisted by A. R. Stevenson, Jr.

## Sugar and Scenery to Feature Western Meeting of Chemical Engineers

**Institute Meets in Denver July 15 to 18—Many Members Planning Side Trips—Technical Meetings Nearly Arranged**

**N**O PAINS are being spared to make the summer meeting of the American Institute of Chemical Engineers a complete success in every way. Denver is to be the place; July 15 to 18 the time. Already twenty-four members have signed up for the trip, many of them planning to take their families. Some are going through to the coast after the meeting, others to Glacier, Yellowstone and Rocky Mountain parks. Literature descriptive of the sightseeing that may be done advantageously is being sent to members.

Plans for the meeting are in the hands of a committee headed by J. V. N. Dorr as chairman. R. W. Shafor, Great Western Sugar Co., who is on the scene in Denver, is busy arranging details there. The Engineering Council of Denver is getting behind the meeting in its co-operation. In addition to the members of the committee named above, finances are in charge of E. C. Reybold, entertainment is to be looked after by Joseph Maudru and W. C. Graham, transportation by William M. Barr, Omaha, and plant inspections by H. N. Dahlberg.

Although arrangements are not complete, the technical side of the program is fairly well arranged. Sugar is to be the central topic for discussion. The papers that are to be delivered include "Disposal of Waste From the Beet-Sugar Industry," E. Bartow; "The Perfection Filter," Henry Howard;

"Cottrell Precipitation," W. A. Schmidt; "Premier Colloid Mill," Jerome Alexander; "Use of Barium in Recovery of Sugar From Molasses," H. W. Dahlberg; "Filtration as Applied to the Beet-Sugar Industry," Joseph Maudru; "Factors Governing Sugar Content of Beets," W. H. Baird. The Anaconda Co. has also agreed to contribute papers on mining.

The inspection trips to be made include the Brighton plant of the Great Western Sugar Co., the Denver Fire Clay Co., the Gates Rubber Co., stockyards and packing houses, American Smelting & Refining Co., Ainsworth Precision Instrument plant and the Coor plant in Golden.

Several sightseeing trips have been arranged for the ladies and families—these include Colorado Springs, Georgetown loop, Corona and Lookout Mountain. This last trip, as well as shorter trips about Denver, will be shared by the men.

J. C. Olsen, secretary of the Institute, who is taking a very active part in organizing the trip, states that New York and Eastern members may leave New York City at 2 o'clock Saturday, July 12, to arrive at Chicago in time to join the party that is to leave there by special train Sunday, July 13, at midnight. In order to facilitate making all necessary arrangements it is urged that members send in advance registration as soon as possible.

### Williams Explains Constitution of American Engineering Council

The organization of the American Engineering Council constitutes a federal system analogous to that under which the government of the United States functions, says Gardner S. Williams of Ann Arbor, Mich., in a prepared statement interpreting the Council's revised constitution. The new constitution permits the re-election of the president, an office now occupied by former Governor James Hartness of Vermont. The statement of Mr. Williams, who is a vice-president of the Council, follows:

"The first change in the revision is the dropping of the name 'Federated American Engineering Societies' and replacing it by 'American Engineering Council' which now stands for the association of societies. The administrative and legislative body, formerly called the American Engineering Council, is now designated the Assembly. The name of the executive board is changed to administrative board and the committee on procedure becomes the executive committee.

"By way of analogy it may be said that the constituent societies correspond to the states in our national government and like them have delegated certain powers to a national organization. This organization, American Engineering Council, therefore corresponds to

the United States. The Assembly then is analogous to Congress, and the administrative board may be said to roughly represent the President and his Cabinet. It may be pointed out that by reason of the method of selecting delegates to the Assembly the latter partakes of the nature of a Senate rather than a House of Representatives, while in its representation proportioned to membership it resembles the House rather than the Senate.

Under the new arrangement provision is made for membership of technical sections of non-engineering societies, of alumni organizations of engineering schools, etc. Past presidents will in future be members of the Assembly for 6 years. Advice of an engineering nature will at all times be available to proper representatives of the national government.

Certain stringent restrictions on the enactment of new legislation are imposed, in that all such proposed legislation, except election of officers and matters of routine business, must be passed with a two-thirds affirmative vote (a) of the representatives present of each of the national member societies having six or more representatives on the Assembly; (b) of the aggregate of the representatives present of the other national member societies; (c) of the aggregate of the representatives present of the local, state and regional member societies.

### Reduced Output of Acetate of Lime in December

The Department of Commerce announces the December production, shipments and stocks of acetate of lime and methanol, based on reports received from manufacturers. For the year 1923 the production of acetate of lime totaled 164,396,124 lb., as compared with 125,345,124 lb. in 1922, while shipments totaled 161,091,798 lb., as against 164,189,061 lb. in the previous year. During this same period the output of methanol amounted to 8,593,727 gal., as compared with 6,808,911 gal. in 1922.

The following table gives the revised figures for production and stocks for the various months of 1923:

	Acetate of Lime	
	Production Lb.	Stocks End of Month, Lb.
Jan.	15,720,839	14,142,952
Feb.	13,469,524	14,498,522
March	14,959,573	12,901,779
April	13,698,154	11,892,803
May	14,822,716	9,007,287
June	14,439,164	9,755,803
July	13,179,716	9,767,173
Aug.	12,960,416	14,623,749
Sept.	11,674,842	18,034,111
Oct.	12,972,591	18,548,830
Nov.	14,684,883	19,249,055
Dec.	11,813,706	18,799,752

	Methanol	
	Production Gal.	Stocks End of Month, Gal.
Jan.	893,418	2,000,039
Feb.	730,590	2,044,429
March	791,457	2,133,098
April	713,643	2,194,789
May	798,369	2,429,617
June	736,806	2,526,412
July	652,955	2,669,895
Aug.	654,822	2,866,218
Sept.	574,124	2,902,923
Oct.	666,364	2,851,938
Nov.	756,746	2,726,866
Dec.	624,433	2,592,298

### Trade Notes

The annual meeting of the Drug & Chemical Club of New York will be held Feb. 21.

F. E. Leiby has resigned his position as sales manager with the General Filtration Co. and has joined the sales force of the Norton Co., of Worcester, Mass.

Fred Lange, formerly connected with Wrede & Lange, has opened an office at 126 Maiden Lane, New York City, and will conduct a brokerage business in chemicals, drugs, gums and oils.

J. H. McCrady, Pittsburgh, Pa., has been elected president of the American Gypsum Co., Port Clinton, Ohio. Other officers elected were: F. J. Griswold, Port Clinton, vice-president; and J. B. Davis, Cleveland, secretary and treasurer.

Alvin Hunsicker, vice-president and general manager of the Standard Textile Products Co., will be the principal speaker at the Chemical Salesmen's meeting which will be held at the Builders Exchange, 34 West 33d St., New York City, on Tuesday evening Feb. 19. Other speakers will include John Boyer, of the Mathieson Alkali Works; A. H. Pierce, of the Grasselli Chemical Co., and F. L. McCartney, of the Monsanto Chemical Works.

## Production Costs of Linseed Oil Compiled for Tariff Hearing

### Comparisons of Crushing Expenses at American, English and Dutch Mills Made by Representatives of Tariff Commission

**I**N CONNECTION with the petition for a lowering in duty on linseed oil, on which a public hearing will be held before the Tariff Commission on March 5, representatives of the commission have made investigations of the linseed oil industry. In these investigations comparisons were drawn between production costs of oil in this country and in England and Holland, the two leading producing countries of Europe. Variations in costs of crushing operations are indicated in the accompanying table.

values of these products obtained from a ton of seed. The costs thus allocated to oil may be compared without including transportation charges, or by including transportation charges on oil shipped to this country.

In methods *a*, *b* and *c* difference between the costs of crushing a ton of flaxseed is attributed entirely to the oil produced. In method *d* the oil and cake each bears a prorated share of the total cost. Costs of production, as shown in the table, for the United

Comparison of Foreign and Domestic Production Costs (Per ton—2,000 lb. of flaxseed crushed)						
Period and Country	Total Cost Including Seed	Seed Cost at Plant	Total Conversion Cost	Direct Labor Cost	Other Factory Expense	Overhead Expense
1922						
United States.....	\$93.08	\$82.66	\$10.41	\$2.78	\$3.26	\$4.37
England.....	81.39	74.15	7.24	2.33	2.05	2.86
Holland*.....	84.26	77.73	6.53	2.29	1.79	2.45
1923 (Jan.-June)						
United States.....	105.19	95.42	9.77	3.03	3.40	3.33
England.....	87.06	81.08	5.98	2.10	1.73	2.15
Difference.....	\$18.13	\$14.34	\$3.79	\$0.93	\$1.67	\$1.18

\*The cost for Holland represent different yearly periods during 1922 and the first 6 months of 1923.

The report to the Tariff Commission stated that the difference in the cost of flaxseed in the United States and in England for 1923 is \$14.34 per short ton. This difference is practically equal to the duty of \$14.28 (40c. per bushel of 56 lb.) on seed entering the United States. This seems to indicate that there is a world's market for seed and that transportation rates from Argentina to the United States and to Europe are practically the same. With the exception of the domestic duty on flaxseed, the crushers in the United States and in England are on practically an equal basis so far as raw materials are concerned.

For the purposes of section 315, the question arises whether production costs in the United States and the principal competing country—the United Kingdom—should be compared on the basis of a ton of flaxseed crushed or on the basis of the linseed oil produced from a ton of flaxseed. The question also arises as to whether transportation charges on the linseed oil and linseed cake should be considered along with production costs.

The four following methods might be used in comparing domestic and foreign costs:

(a) The cost per ton of flaxseed crushed without including transportation charges.

(b) The cost per ton of flaxseed crushed plus transportation charges on oil shipped to this country and on domestic cake shipped to Europe.

(c) The cost per ton of flaxseed crushed plus transportation charges on oil shipped to this country and domestic cake shipped to Europe and less the drawback on domestic cake exported.

(d) The cost per ton of flaxseed crushed distributed to the two products, oil and cake, on the basis of the relative

States and England during the first 6 months of 1923 are compared by these methods on the basis of a yield of 88.8 gal. of oil from a ton of flaxseed.

Method (a)	
(1) Domestic cost per ton of flaxseed crushed, excluding seed cost.....	\$9.77
English cost per ton of flaxseed crushed, excluding seed cost.....	5.98
Difference.....	\$3.79 per short ton of seed crushed or.....
	4.3 cents per gal. of oil
(2) Domestic cost per ton of flaxseed crushed, including seed cost.....	\$105.19
English cost per ton of flaxseed crushed, including seed cost.....	87.06
Difference.....	\$18.13 per short ton of seed crushed or.....
	20.4 cents per gal. of oil

The difference of 4.3c. may be compared with a differential between the duties on seed and oil of 8.85c. per gallon in favor of importing seed as

### Carnegie Institute Hears C.E.A. Lecture on Pittsburgh Industries

The first of a series of lectures at the Carnegie Institute of Technology, Pittsburgh, under the auspices of the Institute and the Chemical Equipment Association, was delivered by H. C. Parmelee on Friday, Feb. 8. The speaker laid the groundwork for chemical engineering in the unit processes that find industrial application. Particular reference was made to the equipment used in performing these operations in the industries of the Pittsburgh district. The recovery of blast-furnace dust and smelter fume, the abatement of smoke and ash nuisance, the recovery of finely divided anthracite, the manufacture of linoleum, the production of aluminum sulphate and caustic soda, the manufacture of iron sulphate from pickling liquor, the refining of oil, the manu-

facture of soap and the preparation of a variety of food products were among the industries referred to.

Method (b)	
Domestic cost per ton of flaxseed crushed.....	\$105.19
Bagging, freight and insurance on cake exported.....	3.70
Barrels and cooperage charges on oil.....	4.74
Total.....	\$113.63
English cost per ton of flaxseed crushed.....	87.06
Barrels and transportation charges on oil.....	6.20
Total.....	\$93.26
Difference.....	\$20.37 per short ton of seed crushed or.....
	22.9 cents per gal.

Method (c)	
Total domestic cost as in (b).....	\$113.63
Drawback on cake exported (deduct).....	3.57
Total.....	\$110.06
Total English cost as in (b).....	93.26
Difference.....	\$16.80 per short ton of seed crushed or.....
	18.9 cents per gal.

The drawback on cake exported when made from imported seed is taken at 10c. per bushel, or \$3.57 per short ton of seed crushed.

Method (d)	
(1) Domestic cost as in (a-2) distributed to linseed oil.....	\$78.37
English cost as in (a-2) distributed to linseed oil.....	56.85
Difference.....	\$21.52 per short ton of seed crushed or.....
	24.2 cents per gal.
(2) Domestic cost of oil as in (d-1) Barrels and cooperage on oil.....	\$78.37
Total domestic.....	4.74
English cost of oil as in (d-1).....	\$83.11
Barrels and transportation charges on oil.....	56.85
Total English.....	6.20
Difference.....	\$63.05
	20.06 per short ton of flaxseed crushed or.....
	22.6 cents per gal. of oil

The commission's investigation indicates that in the United States the value of the oil produced from a ton of flaxseed is 74.5 per cent of the value of all products and in England the value of the oil is 65.3 per cent. These percentages have been used in method *d* in distributing the total cost of crushing a ton of flaxseed to linseed oil.

### Lightweight Paper to Be Made in Projected Canadian Mill

The Anglo-American Paper Co., Ltd., is a new concern that has just been incorporated in Canada with headquarters in Merriton, Ont. A mill will be constructed early this spring for the manufacture of lines of lightweight papers not now made in Canada. The company's charter authorizes a capital of 10,000 preferred shares of \$100 par value and 10,000 common shares. The officers of the new company are: William H. Howe, Hammermill Paper Co., president; L. H. Gardner, Garden City Paper Mills Co., Ltd., vice-president; Charles V. Syrett, Canadian Vegetable Parchment Co., Ltd., secretary, and Leo E. Charles, treasurer.

# Market Conditions

## Prices for Chemicals Hold Steady Level in Quiet Market

**Very Few Fluctuations in Value Reported in Past Week—Contract Commitments Restrict Spot Trading**

REGULAR deliveries are being made against contracts and consumers of heavy chemicals in general are being supplied in this way and find no necessity for entering the current market as purchasers. Scattered buying is noted in the case of other chemical products with rather routine conditions prevailing. Production of chemicals in January is reported to have gained in volume over that for December and these reports are substantiated by figures which tell of an increase in the number of workers in chemical plants during January.

Consumption of chemicals, also, is said to be gaining in volume. This is in sympathy with wider operations on the part of large consuming industries. Rather marked increase in activity is ascribed to the tanning trade. Manufacturers of rubber products are a little more active and paint and color companies are holding up to the standards of recent months. The insecticide chemicals are slow to improve and buying by fertilizer manufacturers has been below expectations.

Measured by *Chem. & Met.*'s weighted index number, prices for chemicals and allied products were not subjected to much variation during the week. The number stood at 163.62 as compared with 163.49 for the preceding week, but the advance was largely due to a higher selling price for linseed oil. Basic chemicals appear to be at well established price levels and with few exceptions, the entire list is regarded to be at relatively low levels. Where imported chemicals come into competition with domestic it is more difficult to judge price trends because a larger number of conditions enter into the manufacturing and distributing branches of the industry.

Strong markets are in evidence for many of the metals, with lead, zinc and tin in an especially firm position. This condition is communicated to the metal salts and higher prices are regarded as probable.

### Acids

Oxalic acid has attracted considerable attention because of the unsettled position of the market. Factors in the domestic trade have been active and foreign material has been finding keener competition in recent weeks. Pressure is greater at Eastern points owing to the greater prominence there of imported grades. Spot offerings at New York are held at 11½c. per lb. with

domestic acid at 11c. per lb. at works. Citric and tartaric acids have been in better demand and the price tone is firmer in line with steadier markets abroad. Domestic makers of tartaric are still at a disadvantage as preference is given to foreign makes because of price considerations. This undoubtedly will have the effect of curtailing home production. Acetic acid holds at former price schedules but the market has been unsettled and buyers have

### Sal Ammoniac Easier—Arsenic Still Unsettled—Slow Call for Calcium Arsenate—Prussiates Hold Steadier Position—Barium Carbonate Sells Off—Formaldehyde Steady—Bleaching Powder and Liquid Chlorine Advance in Price

been able to secure concessions. The mineral acid group is none too steady in price but there has been a better call for stocks and in some selections a greatly improved market is reported.

### Potashes

**Bichromate of Potash**—This material is practically under control of producers. Very little resale goods are to be had and competition is at a minimum. Open quotations of makers range from 9½c. to 10c. per lb. with quantity as the governing factor. On extra large lots it is possible to do 9½c. per lb. but the higher quotations are most commonly heard.

**Caustic Potash**—For a long time this material has held around 6½c. per lb. in the spot market and that price is still quoted. Some domestic caustic has been offered but always at a premium over the imported and the latter is in supply sufficient to fill all needs of consumers. Higher prices for imported are not looked for as shipments are offered at 6½c. per lb.

**Carbonate of Potash**—Outside of irregular buying of spot material, the market has shown no development. Higher percentage grades are dull and 96-98 per cent was little better than nominal at 5½@5½c. per lb. Hydrated 80-85 per cent was held at 5½@5½c. per lb., and calcined 80-85 per cent was available at the same price. There is no interest in forward positions, which are about on a par with spot prices.

**Permanganate of Potash**—Imported permanganate has been more firmly held and where a short time ago as low as 13½c. per lb. could have been done, buyers now find 14c. per lb. an inside figure and imported grades are not free at that level. A fair movement from domestic works is reported but trading in spot material is slow.

**Prussiate of Potash**—Offerings of yellow prussiate on spot are fairly free at 20c. per lb. but the material is finding a very poor outlet. A year ago the spot price was 38c. per lb. and the differential between the potash and soda product was 19c. per lb. while the present differential is only 8½c. per lb. This should have resulted in a correspondingly increased consumption of potash but such has not been the case. Yellow prussiate for shipment is offered at 18½c. per lb.

### Sodas

**Bicarbonate of Soda**—This market is largely a matter of contract deliveries as consumers are covered ahead and are receiving supplies against old orders. Asking prices are \$1.75 per 100 lb. in bulk, \$2 per 100 lb. in bbl., and \$2.25 per 100 lb. in kegs, all f.o.b. works.

**Bichromate of Soda**—New business is not active but interest is said to be growing and selling pressure is practically absent. Some consuming trades are working into a better position and this favors a more active trading movement. Prices are firm at 7½@7½c. per lb. with contracts possible as low as 7½c. per lb. The latter figure, however, is by no means free and only very large lots can be purchased below 7½c.

**Caustic Soda**—Import inquiry has been present but actual buying for export has not been heavy. This is indicated by the fact that \$3 per 100 lb. f.a.s. New York was quoted by some sellers who previously had been holding \$3.05 per 100 lb. as an inside price. Buying in the spot market was quiet last week and the less carlot trade was slow. There is nothing new in the way of price changes and both first hands and dealers are maintaining former schedules.

**Cyanide of Soda**—Various trades have been buying this chemical and total volume of business is well up to normal standards. Prices vary according to seller and grade. Standard domestic makes are quoted at 22@23c. per lb. Imported cyanide is available under the price asked for domestic.

**Nitrate of Soda**—Resale material is still a factor, especially in the South but reports of sales at \$2.40 per 100 lb. were heard. The market, however, appeared to be a little steadier and general quotations ranged from \$2.45 to \$2.48 per 100 lb. While a part of

the fertilizer trade is covered ahead, prospects for increased sales of nitrate are bright if credence may be placed in reports of a greatly increased production of fertilizers this season.

**Prussiate of Soda**—Spot holdings are reported to have decreased in volume and recent sales have been more encouraging. Values have reached a steady level and sellers are not willing to shade 11½c. per lb. in the spot market. Nearby positions can be negotiated at 11½c. per lb.

**Soda Ash**—While reports on this material fail to reveal any changes in conditions, they tell of a continued movement from works and show that producers are not accumulating large stocks. The trade is largely a contract matter and with no delays in shipments by producers or in issuing shipping instructions by consumers, the market may be regarded as satisfactory. The steady position of prices also is a feature and this applies both to large and small lots.

#### Miscellaneous Chemicals

**Acetate of Lime**—Official figures are now available for 1923 production and show the output reached a total of 164,396,124 lb. as compared with 125,345,124 lb. in 1922. Shipments for the year were 161,091,798 lb. which was 3,097,263 lb. less than in 1922. Stocks on hand at the close of the year also showed a gain of more than 3,000,000 lb. over the corresponding period of 1922. While some of the wood distillation products have gone down in price there has been no change in the quotation of \$4 per 100 lb. for acetate of lime.

**Arsenic**—It was announced last week that a new plant in the West had started to operate and would produce arsenic. In spite of expectations that consumption of arsenic this year would be unusually heavy, this is not borne out by reports of trading in recent weeks. Last week also was quiet and as far as spot buying is concerned it is featureless. It is difficult to hold values steady under such conditions and while 12½c. per lb. is still asked for spot holdings, this figure is easy and can be shaded. The market for calcium arsenite also is quiet and activity in arsenic depends to a great extent on the opening up of buying in arsenate.

**Bleaching Powder**—The market was featured by an advance in price, effective Feb. 14. The new price schedule quotes spot and contracts, in carloads, at \$1.75 per 100 lb. in standard drums, and \$2 per 100 lb. in small drums, both prices being f.o.b. works. Liquid chlorine also was marked up in all positions with revised prices at \$4 per 100 lb. in tanks, \$5 per 100 lb. in cylinders, carload lots, \$5.50 per 100 lb. in cylinders for sales of more than 1 ton, \$6 per 100 lb. in cylinders, for sales of 1 ton or less.

**Copper Sulphate**—According to some reports there has been a fairly steady demand for domestic grades and sales of carlots have been made at \$4.50 per 100 lb. The asking price for domestic ranges up to \$4.75 per 100 lb. Imported sulphate has not changed its position and is offered at \$4.50 per 100 lb. on

#### "Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	163.62
Last week	163.49
Feb. 1923	178.00
Feb. 1922	148.00
Feb. 1921	166.00
Feb. 1920	252.00
Feb. 1919	250.00
Feb. 1918	285.00

Easier prices for minor chemical items were offset by the moderate advance in linseed oil and the index number showed no important variation, settling at 163.62, a net gain of 13 points.

spot and at 4½c. per lb. for shipment from abroad.

**Sal Ammoniac**—Buying was less active during the week and the market was hardly as firm as in the preceding week. Imported white granular was still offered at 6½c. per lb., but this price was easy and on firm bid it was stated that 6½c. per lb. could be done. Prompt shipment from abroad is firmly held but later positions were offered at 6½c. per lb.

**Sulphate of Ammonia**—Producers are well sold ahead for the present and with consumers covered, there is not much interest in the present market. Export demand fell away when prices strengthened and the lack of prompt offerings places a check on export business even if buyers would pay the prices asked. Quotations are largely nominal at \$2.90@\$3 per 100 lb., works.

#### Alcohol

Demand for denatured alcohol continues to hold up very close to expectations and a firm undertone prevails in all quarters. Basic materials have been firmly maintained and this accounts for much of the bullish sentiment in producing circles. Prices closed the week unchanged on the basis of 44½c. per gal., for the No. 5 completely denatured, in drums, carload lots. The output of methanol has been restricted, official figures indicating that production was reduced from 756,746 gal. in November to 624,433 gal. in December. The market for methanol was quatably unchanged, the pure in tanks holding at 90c. per gal.

## Coal-Tar Products

#### Benzene Firm at Advance—Stocks of Crudes Moderate—Refined Naphthalene in Better Request—Phenol Scarce

**N**O ADDITIONAL price changes took place in the market for crudes, offerings in most instances being moderate, with the undertone firm. The recent advance in benzene stimulated buying interest and leading producers reported enough new business to absorb production. Byproduct coke oven operations have increased in the past month and actual production of tar has shown a corresponding gain. The higher prices for phenol did not bring about any appreciable increase in the output of the synthetic product, producers taking the stand that the market could not absorb greater quantities without depressing the selling basis for contract material. Naphthalene was steady on firmer views of holders of the refined who look for business to open up soon. Cresylic acid remains unsettled, but reports on the state of trade were a little more encouraging. The English markets for coal-tar products were quiet and barely steady, offerings of creosote oil, cresylic acid and crude naphthalene increasing.

**Benzaldehyde**—Competition in the technical grade has increased and prices now present a rather unsettled appearance, it being possible to shade 70c. per lb. on a firm bid.

**Benzene**—Good buying of the motor grade was reported. Producers say that stocks are comparatively small for this season of the year. The undertone of the market was firm in all quarters, but no immediate change in prices is expected. On the 90 per cent grade first hands quote 23c. per gal., and on the pure 25c. per gal., tank cars, f.o.b. works. Export demand was fair.

**Creosote**—Offerings from abroad have been larger and slightly easier

prices prevailed on shipment goods. English makers quote from 9d. @ 9½d. per gal., loose, works, with demand slow.

**Cresylic Acid**—There was a fair call for the higher grades and while prices covered a wide range the undertone in some quarters was quite steady. On the 97 per cent material the market settled at 70@75c. per gal., with the 95 per cent at 67@68c. per gal., in drums. Manchester quotes 60 per cent cresylic for shipment at 2s. 1d. per gal., loose, works.

**Naphthalene**—Refined flake was offered at 6@6½c. per lb., the price depending upon the quantity and seller. Prices appeared firmer, production in more than one direction being well sold up. On ball the market stood at 7c. nominal. Chips held at 5½@5½c. per lb., carload basis. High grade crude for prompt shipment from Manchester, England, was offered at 10 per ton, while inferior stock was offered down to 6 per ton.

**Phenol**—Regular trade is being supplied with U.S.P. phenol at prices ranging from 28@29c. per lb., in drums. In the outside market nominal quotations range from 35@37c. per lb., in drums. Small lots of phenol, in tins, sold at 31c. per lb. Offerings were scanty, production of both natural and synthetic being sold up.

**Pyridine**—There were offerings of imported at \$3.50 per gal. Demand was quiet and prices unsettled.

**Xylol**—Leading producers offered commercial xylol for immediate shipment at 28c. per gal., tank cars, works. The refined material was in moderate supply, production being restricted because of the rather limited call from the consuming trade.

## Vegetable Oils and Fats

### Cottonseed Oil Irregular—Spot Linseed Advances—Inquiry for Coconut—Tallow and Greases Firmer

**C**ONSUMING demand for vegetable oils and animal fats was anything but active in the past week, but a better feeling was in evidence towards the close, as quite a few inquiries were around at a shade under the market for such materials as coconut oil, palm oils and tallow. Prices underwent little change, crude cottonseed going off slightly at times, but steady on any show of business. Linseed oil for February-March-April delivery advanced 1c. per gal.

**Cottonseed Oil**—Switching operations in the option market for refined oil accounted for most of the business. The South sold nearby oil, but took back May and July contracts. The offerings were absorbed without difficulty, refiners taking March contracts against sales of May. Local shorts covered on a better feeling in lard. Cash demand for refined oil was fair, while lard compound business was described as quiet. Some traders held to the opinion that the South is still heavily long of March contracts, but conservative operators believe that the near position has been fairly well liquidated. Offerings of crude oil continued on a limited scale, and, while several cars did sell down to 8½c. per lb., f.o.b. mills, Southeast, early in the week, bids at 8½c. were turned down just before the close. Sellers' views on crude were firm at 9c. per lb., tank cars, f.o.b. mills. The January report on cottonseed products will be issued some time this week and it is expected that the statement will not compare favorably with the January report of a year ago. Lard compound settled at 12½c., carload lots, f.o.b. New York.

**Coconut Oil**—About a week ago several tank cars of Ceylon type oil sold on resale at 8½c. per lb., f.o.b. San Francisco. Later bids at this price were turned down and the market settled at 8½@8½c. per lb., tank cars, Pacific coast ports. In New York 8½c. was bid for nearby oil, with holders asking 8½c. per lb. The undertone was steady.

**Linseed Oil**—Trading was slow, but the advance in seed prices steadied the market. Prompt shipment oil was advanced 1c. per gal., closing at 93c. per gal., carload lots, cooperage basis. Several crushers asked this price on futures, but admitted that absence of buying interest made it impossible to tell just what might be done on May forward oil. It was reported that some of the largest consumers of oil are not covered ahead for more than a month or two, restricting buying because of what appears to be a bearish situation in the seed markets. Traders point to the increase in shipments of flaxseed from the Argentine as proof that a large crop was raised. According to seed importers the demand for Argentine seed has been enormous, especially from Europe, upsetting all calculations. Speculators in the Argentine know that they control the flaxseed markets of the world and have been operating on the long side for some time now. An

authority on seed predicted that no real change in the situation will take place until reports from the American northwest reveal a substantial increase in the acreage this spring. Shipments from the Argentine to all countries since the first of the year amounted to 12,000,000 bu., comparing with some 10,000,000 bu. for the corresponding period a year ago. Prompt shipment linseed cake held around \$41 per ton, but on futures bids were nearer \$33 per ton, f.a.s. New York. The weakness in cake for future delivery ac-

### Gain in Oil Seeds Imports Into United Kingdom

British trade returns reveal a general increase in imports of oil seeds during 1923. Importations of linseed in the past year amounted to 381,504 tons, against 358,849 tons in 1922. United Kingdom statistics, in tons, for the past 2 years, follow:

	1922	1923
Linseed:—		
Argentina.....	178,995	169,967
India.....	158,231	190,464
Russia.....	422	1,914
Canada.....	327	
Other countries.....	20,874	19,159
Soya Beans:—		
Russia.....	27,187	63,700
China.....	18,470	20,948
Japan.....	13,700	28,414
Palm kernels.....	212,138	261,541
Copra.....	86,084	86,550
Peanuts.....	65,756	96,604
Rapeseed.....	33,410	60,898

counted, in part, for some of the strength in oil.

**China Wood Oil**—The market was unsettled, business in tank cars passing at 17½@18c. per lb., f.o.b. San Francisco. For oil in cooperage operators in New York held out for 19@19½c. per lb., immediate and nearby delivery.

**Corn Oil**—Crude corn oil sold at 9½c. per lb., tank cars, f.o.b. point of production.

**Olive Oil Foots**—It was reported that some importers will not be in a position to make delivery of oil purchased on contract and this tends to support the market in all of the nearby positions. Prime green Italian foots on spot sold as high as 10½c. per lb. On futures 9½c. could have been done.

**Palm Oils**—Inquiry for futures better, but prices closed about unchanged. Lagos on spot was offered at 7½c., with futures at 7.80c. per lb. Niger on spot was offered at 6½c. per lb., while on forward material 7c. was asked.

**Rapeseed Oil**—English refined oil on spot sold at 87c. per gal., in bbl., but on futures nominal quotations ranged from 81@83c. per gal., according to position.

**Soya Bean Oil**—Bulk oil was nominal at 7.10c. per lb., in bond, forward shipment from the Orient, c.i.f. Pacific coast ports. Demand was dull. Crude soya, duty paid, tank cars, offered in a limited way at 9½c. per lb., f.o.b. coast.

**Fish Oils**—Crude menhaden was available in a small way at 47½c. per gal., tank basis, fish factory, but bids were considerably under this level. Newfoundland cod oil nominal at 65c. per gal., in bbl., immediate delivery.

**Tallow, Etc.**—There were buyers of extra tallow at 7½c. per lb., ex-plant, indicating that the market has steadied. Yellow grease steady at 6½c. per lb. Oleo stearine nominal at 10c. per lb., carload basis. Red oil, distilled and saponified offered at 8½@9c. per lb., carload basis. Pale English degras firm at 5½@5½c. per lb.

### Miscellaneous Materials

**Antimony**—Holdings of antimony on spot are moderate and with little change in shipment prices a steady undertone prevails. Chinese and Japanese brands held at 10½c. per lb. Cookson's "C" grade was offered at 13c. per lb. Chinese needle, lump, nominal at 8@9c. per lb. Powdered needle, 200 mesh, 8½@9c. per lb. White ocise, Chinese, 99 per cent, nominal at 9c. per lb.

**Casein**—Arrivals of South American material have been smaller and this has steadied the market to some extent. Holders of imported and domestic are asking from 12@13c. per lb., the price depending upon the quantity and delivery. Demand was quiet.

**Glycerine**—Sales of dynamite glycerine went through at 14½c. per lb., a decline of 4c. Demand for the chemically pure was inactive and keen competition tends to unsettle prices. Leading refiners continued to quote the market at 16½c. per lb., carload basis, but admitted that this price could have been shaded at points in the West. Crude soap lye, basis 80 per cent, was nominally unchanged at 10½c. per lb., loose, f.o.b. point of production. Saponification, basis 88 per cent, settled at 11½@11½c. per lb., loose, carload lots.

**Naval Stores**—No improvement in demand and the market developed further weakness, spirits of turpentine closing at \$1 per gal., a decline of 2c. for the week. Export demand also was slow. Paint manufacturers are not contracting ahead. Rosins in fair demand and steady at \$5.70@\$5.80 per bbl. on the lower grades.

**White Lead**—Interest centered in the tight situation in pig lead. The metal closed at 8.25c. per lb., so far as the leading producer was concerned, but in the open market much higher prices prevailed. The high prices for lead are working to the disadvantage of some corroders, some of the smaller factors being poorly supplied with the metal. Fortunately, the demand for white lead has not been so active, offering some relief in the general situation. Leading corroders quote standard dry white lead at 9½c. per lb., in casks.

**Zinc Oxide**—A steady undertone was reported for zinc oxide, reflecting recent advances in the metal. Demand has been fair, but competition among producers has been keen and no change in the selling schedule took place. American process, lead free, held at 6½c. per lb., carload basis, prompt shipment.

# Imports at the Port of New York

February 8 to February 14

**ACIDS—Cresylic**—60 dr., Glasgow, Order; 23 dr., Liverpool, W. E. Jordan & Bro.; 1 dr., Liverpool, H. S. Head, Laetie—10 bbl., Hamburg, Chase National Bank.

**Phenol**—36 dr., Liverpool, Bank of the Manhattan Co.

**Tartaric**—400 bbl., Bari, Superfoss Co.

**AMMONIUM CARBONATE**—30 cs., Liverpool, Brown Bros. & Co.; 4 bbl., Liverpool, Order.

**AMMONIUM PERCHLORATE**—200 csk., Liverpool, Order.

**ANTIMONY**—150 cs. crude, London, C. B. Richard & Co.; 220 cs., London, Order.

**ANTIMONY REGULUS**—200 cs., Han-kow, F. A. Cundill & Co.; 100 cs., Ham-burg, Order.

**ANTIMONY SULPHIDE**—7 csk., Antwerp, L. H. Butcher & Co.

**ARSENIC**—184 csk., Brisbane, Order; 250 cs., Shanghai, C. Gitlan; 59 bbl., Antwerp, Schulz & Ruckgaber; 67 csk., Antwerp, Chemical National Bank; 105 bbl., Antwerp, Order; 40 csk., Antwerp, Order; 4 pkg. ore, Trieste, Watson, Geach & Co.

**BARYTES**—420 bg., Bordeaux, Order.

**BLEACHING POWDER**—165 cs., Liver-pool, L. C. Dever.

**CASEIN**—834 bg., Buenos Aires, Me-matics & Metals National Bank.

**CHALK**—500 tons, London, Baring Bros. & Co.; 1,800 bg., Antwerp, Cooper & Cooper; 1,900 bg., Antwerp, Reichard-Coulston, Inc.; 2,440 bg., Antwerp, Brook-lyn Trust Co.; 1,867 bg., Antwerp, Bankers Trust Co.; 660 bg., Antwerp, Order.

**CHEMICALS**—95 bbl., Antwerp, Order; 126 cs., Liverpool, H. W. Peabody & Co.; 24 pkg., Bremen, Roessler & Hasslacher Chemical Co.; 39 csk., Bremen, Order; 20 pkg., Hamburg, Franklin Import & Export Co.

**COAL-TAR DISTILLATE**—144 dr., Liverpool, Order.

**COLORS**—12 cs. aniline, Genoa, B. Ber-nard, Inc.; 23 cs. do, Genoa, Am. Ex-change National Bank; 3 cs. do, Genoa, Bernard, Judae & Co.; 27 csk. aniline, Antwerp, American Exchange Natl. Bank; 10 csk. blue, Havre, Reichard-Coulston, Inc.; 12 pkg. aniline, Genoa, Order; 7 csk. aniline, Genoa, American Exchange Natl. Bank; 5 cs. aniline, Genoa, Order; 7 pkg. aniline, Hamburg, Franklin Import & Export Co.; 3 cs. aniline, Gothenburg, Na-tional Aniline & Chemical Co.; 8 cs., Lon-don, Order; 5 csk. aniline, Havre, Carbic Color & Chem. Co.; 6 pkg. aniline, Havre, Sandor Chemical Works; 5 csk. do, Havre, W. F. Sykes & Co.

**COPPER SULPHATE**—200 csk., Liver-pool, Order.

**CUTCH**—100 bx., Rangoon, Order.

**DIVI-DIVI**—1,421 bg., Curacao, Selma Mercantile Corp.

**GLYCERINE**—90 csk. crude, Marseilles, Order.

**GRAPHITE**—226 bg., Marseilles, N. Y. Trust Co.

**GUMS**—200 bg. copal, Antwerp, Brown Bros. & Co.; 319 bg. copal, Manila, Innes & Co.; 100 cs. copal, Singapore, Kiddier, Peabody & Co.; 50 cs. copal, 192 bg. damar and 150 cs. do, Singapore, Brown Bros. & Co.; 70 bg. copal, Singapore, Order; 225 bg. copal, Antwerp, Order; 110 bg. copal, Antwerp, W. Schall & Co.; 100 bg. do, Antwerp, Central Union Trust Co.; 500 bg. copal, Antwerp, Order; 50 cs. damar and 245 bg. do, Singapore, L. C. Gillespie & Sons; 50 cs. damar, Singapore, Brown Bros. & Co.; 420 cs. damar, Singapore, Order; 200 cs. damar, Batavia, Chemical Na-tional Bank; 500 cs. damar, Batavia, Order; 110 bskt. copal, Macassar, Irving Bank-Col. Trust Co.; 66 bskt. do, Macassar, Order; 403 pkg. do, Macassar, A. Klipstein & Co.; 64 bskt. do, Macassar, S. Winterbourne & Co.; 114 bskt. do, Macassar, M. L. Van Norsen; 120 bskt. do, Macassar, W. H. Scheel; 815 bskt., 287 bg. and 28 cs. do, Macassar, Innes & Co.; 354 pkg., Macassar, Order.

**IRON CHLORIDE**—45 dr., Liverpool, Philipp Bros.

**IRON OXIDE**—164 bbl., Malaga, C. J. Osborn & Co.; 75 bbl., Malaga, E. M. & F. Waldo; 243 bbl., Malaga, C. K. Wil-liams & Co.; 15 bbl., Malaga, Order; 56 csk., Liverpool, Order.

**LITHOPONE**—100 csk., Antwerp, A. Klipstein & Co.; 3 csk., Hamburg, Ellis

Jackson & Co.; 60 csk., Antwerp, A. Klipstein & Co.

**LOGWOOD EXTRACT**—5 bbl., Cape Haitian, Logwood Mfg. Corp.

**MAGNESIUM CITRATE**—30 cs., Genoa, F. N. Glavi, Inc.

**MAGNESIUM CHLORIDE**—158 dr., Hamburg, Brown Bros. & Co.

**MANGANESE**—13 csk., Marseilles, De Courcy, Browne Co.

**NAPHTHALENE**—351 bg., Antwerp, Order; 294 bg., Antwerp, Order.

**OCHER**—343 csk., Marseilles, Am. Ex-change Natl. Bank; 501 csk., Marseilles, Reichard-Coulston, Inc.

**OILS—Coconut**—750 tons (bulk), Spenger Kellogg & Sons. **China Wood**—300 csk., Hankow, G. W. S. Patterson & Co.; 103 csk., Hankow, Jardine, Matheson Co.; 72 bbl., Hamburg, Order; 60 bbl., London, Irving Bank-Col. Trust Co. **Cod**—110 csk. St. Johns, R. Badcock & Co. **Olive Roots** (sulphur oil)—600 bbl., Malaga, International Banking Corp.; 262 bbl., Seville, J. B. Dewenap & Co. **Palm**—110 csk., Liver-pool, Order; 256 pkg., Hamburg, African & Eastern Trading Co.; 38 csk. and 82 bbl., Liverpool, J. H. Faunce. **Palm Kernel**—52 csk., Antwerp, Order; 143 bbl., Liver-pool, Order. **Rapeseed**—95 bbl., Liverpool, Bank of America. **Sesame**—200 csk., Marseilles, Order; 25 bbl., Marseilles, Order.

**OIL SEEDS—Copra**—3,182 sk., Manila, Spencer Kellogg & Sons; 1,717 sk., Davao, Atkins, Kroll & Co. **Castor seed**—54 bg., Port de Paix, Mann & Co. **Linseed**—17,924 bg., Rosario, American Linseed Co.; 45,801 bg., Rosario, L. Dreyfus & Co.; 40,109 bg., Rosario, Spencer Kellogg & Sons; 33,034 bg., Buenos Aires, Order. **Sesame**—2,100 bg., Hankow, Bank of N. Y. & Trust Co.

**PITCH**—450 bbl. stearine, Liverpool, Order.

**PLUMBAGO**—50 bbl., Colombo, Order.

**POTASSIUM SALTS**—21 csk. prussiate, Copenhagen, Superfoss Co.; 650 bg. sulphate, Hamburg, Potash Importing Corp. of America; 5,449 bg. muriate and 256 bg. sulphate, Antwerp, Societe Comm. des Potasses d'Alsace; 16 csk. carbonate, Bremen, P. H. Petry & Co.

**PYRIDINE**—6 dr., Liverpool, Monsanto Chemical Works.

**QUEBRACHO**—2,053 bg., Buenos Aires, First National Bank of Boston; 2,065 bg., Buenos Aires, Mechanics & Metals National Bank; 1,951 bg., Buenos Aires, International Products Co.; 1,024 bg., Buenos Aires, Irving Bank-Col. Trust Co.; 2,028 bg., Buenos Aires, Order.

**QUICKSILVER**—350 flasks, Leghorn, Order.

**HELLAC**—142 bg. garnet, Hamburg, Irving Bank-Col. Trust Co.; 98 bg. garnet, Hamburg, Kasebler-Chatfield Shellac Co.; 50 cs., Hamburg, Rogers, Pyatt Shellac Co.; 1,551 bg. shellac, 445 bg. seedlac, 25 pkg. button lac, 100 bg. garnet, 25 cs. do., 727 bg. refuse and 2 bg. kirie, Calcutta, Order; 25 cs., London, Order; 44 bg., Havre, Doher, Grimm Co.

**SILVER SULPHIDE**—72 cs., Antofa-gasta, Watson, Geach & Co.

**SODIUM SALTS**—754 bg. fluoride, Copenhagen, Order; 120 csk. hyposulphite, Hamburg, Order; 300 bg. phosphate, Ant-werp, Hollingshurst & Co.; 190 bg. do., Antwerp, Order; 356 cs. cyanide, Marseilles, Asia Banking Corp.; 331 csk. hyposulphite, Marseilles, Order; 40 keg hydrosulphite, Liverpool, Kuttroff, Pickhardt & Co.; 100 cs. cyanide, Liverpool, Order; 10,059 bg. nitrate, Antofagasta, Wessel, Duval & Co.; 18,266 bg. do., Mejillones, Wessel, Duval & Co.; 7,077 bg. do., Iquique, A. Gibbs & Co.; 14,009 bg. nitrate, Iquique, Wessel, Duval & Co.; 140 csk. hyposulphite, Hamburg, Order; 168 cs. cyanide, Havre, Asia Banking Corp.; 21,580 bg. nitrate, Iquique, W. R. Grace & Co.

**SUMAC**—700 bg. ground, Palermo, Order.

**TALC**—250 bg., Genoa, L. A. Salomon & Bros.; 800 bg., Bordeaux, Whittaker, Clark & Daniels; 500 bg., Bordeaux, C. B. Chrystal & Co.; 1,600 bg., Bordeaux, L. A. Salomon & Bros.; 200 bg., Bordeaux, E. M. & F. Waldo.

**TARTAR**—425 bg., Marseilles, Tartar Chemical Works; 87 bg., Marseilles, C. Pfizer & Co.; 395 bg., Marseilles, Tartar

Chemical Works; 422 sk., Marseilles, C. Pfizer & Co.; 450 bg., Buenos Aires, Anglo South American Bank.

**VANADIUM**—6,445 bg., Callao, Vana-dian Corp.

**VERMILION**—12 cs., London, Pomeroy & Fischer.

**WAXES**—29 pkg. beeswax, Valparaiso, K. Statton; 25 bg. montan, Hamburg, Order; 224 pkg. beeswax, Liverpool, Order; 320 bg. white paraffine, London, Smith & Nichols, Inc.; 24 bg. beeswax, San Antonio, Strohmeyer & Arpe.

**WHITING**—250 bg., Antwerp, Stanley, Doggett Co.

**WOOL GREASE**—90 bbl., Antwerp, Order; 24 bbl., Liverpool, Elbert & Co.; 36 csk. and 11 cs., Bremen, Pfaltz & Bauer; 60 bbl., Bremen, Schneider Bros. & Co.

**ZINC OXIDE**—50 bbl., Antwerp, Philipp Bros.; 225 bbl., Antwerp, Brown Bros. & Co.

**ZINC WHITE**—150 bbl., Marseilles, Reichard-Coulston, Inc.; 100 csk., Marseilles, F. B. Vandegrift & Co.; 50 bbl., Marseilles, Order.

## Industrial Notes

THE AJAX RUBBER Co. of New York has elected its president chairman of the board of directors in addition to his present office, succeeding the late Horace de Lissner. E. L. Fries, treasurer, has been elected secretary and will act in both capacities. G. E. Shipway, heretofore assistant to the chairman of the board, has been elected vice-president and general manager, and will be succeeded in his former position by Enderle McVoorhees, auditor.

THE HIND & DAUCH PAPER Co. Sandusky, O., has elected Sidney Frohman president, succeeding Fred Emmons, who was Mr. Frohman's successor when he retired from the position 2 years ago. George Little has been elected vice-president; R. K. Ramsey has been elected vice-president and treasurer, succeeding O. W. Rinderle; W. F. Pfeffer has been elected secretary to succeed C. N. Klepper.

THE GENERAL TIRE & RUBBER Co. Akron, O., has elected William O'Neill president and general manager. He was formerly vice-president and general manager, and will remain chairman of the board of directors. W. E. Fouse, secretary, has been elected vice-president, and will be succeeded in his previous office by T. F. O'Neill. C. J. Jahant, superintendent, has been elected vice-president. Charles Heberich has been re-elected treasurer.

LATHROP & TROTTER is the new firm name of the Cincinnati representatives of the Conveyors Corporation of America, 326 West Madison St., Chicago, Ill., Jay C. Lathrop having associated with himself L. E. Trotter. The offices of the firm are 733 Union Trust Bldg., Cincinnati, O. The new firm will handle the sale of American steam jet ash conveyors, American air-tight doors, cast-iron storage tanks, and other power plant equipment in Cincinnati and the surrounding territory.

THE VITREFRAX Co., Los Angeles, Calif., announces that M. R. Stowell, for many years sales manager for the American Refractories Co., has joined its staff as sales manager of the Western division, covering the entire Pacific coast and the Southwest.

HAROLD P. MARSHALL, until recently advertising manager for Dwight P. Robinson & Co., Inc., left New York early in January to take up his new duties as advertising manager for Warren Webster & Co., engineers and manufacturers of steam-heating systems.

F. J. RYAN & Co. announce that J. L. Edwards, who has been in charge of the Pittsburgh territory with offices in the Oliver Bldg., Pittsburgh, Pa., is no longer in charge of that territory and that all business in relation to the Pittsburgh territory for the time being will be direct from the Philadelphia office, which is located in the Wesley Bldg.

THE HERCULES CARBOY BOX Co., of Newark, N. J., has just completed the erection of a new addition to its plant in order to extend its facilities in the manufacture of Hercules carboy boxes for the shipment of acids in glass carboys.

# Current Prices in the New York Market

*For Chemicals, Oils and Allied Products*

## General Chemicals

Acetone, drums, wks.	lb. \$0.19 - \$0.19
Acetic anhydride, 85%, dr.	lb. .38 - .38
Acid, acetic, 28%, bbl.	100 lb. 3.38 - 3.63
Acetic, 56%, bbl.	100 lb. 6.75 - 7.00
Acetic, 80%, bbl.	100 lb. 9.58 - 9.83
Glacial, 99%, bbl.	100 lb. 12.00 - 12.78
Boric, bbl.	lb. .10 - .10
Citric, kegs	lb. .46 - .48
Formic, 85%	lb. .13 - .13
Gallie, tech.	lb. .45 - .50
Hydrofluoric, 52%, carboys	lb. .11 - .12
Lactic, 44%, tech., light,	bbl. .11 - .12
22% tech., light, bbl.	lb. .05 - .06
Muriatic, 18% tanks	100 lb. .90 - 1.00
Muriatic, 20%, tanks	100 lb. 1.00 - 1.10
Nitric, 36%, carboys	lb. .04 - .05
Nitric, 42%, carboys	lb. .05 - .05
Oleum, 20%, tanks	ton 18.50 - 19.00
Oxalic, crystals, bbl.	lb. .11 - .11
Phosphoric, 50% carboys	lb. .07 - .08
Pyrogallie, resublimed	lb. 1.55 - 1.60
Sulphuric, 60%, tanks	ton 9.00 - 11.00
Sulphuric, 60%, drums	ton 13.00 - 14.00
Sulphuric, 66%, tanks	ton 15.00 - 16.00
Sulphuric, 66%, drums	ton 20.00 - 21.00
Tannic, U.S.P., bbl.	lb. .65 - .70
Tannic, tech., bbl.	lb. .45 - .50
Tartaric, imp., powd., bbl.	lb. .27 - .27
Tartaric, domestic, bbl.	lb. .30 - .30
Tungstic, per lb.	lb. 1.20 - 1.25
Ucohol, butyl, drums, f.o.b. works	lb. .45 - .50
Alcohol ethyl (Cologne spirit), bbl.	gal. 4.85 - ...
Ethyl, 190 p.f. U.S.P., bbl.	gal. 4.81 - ...
Alcohol, methyl (see Methanol)	
Alcohol, denatured, 190 proof	
No. 1, special bbl.	gal. .51 - ...
No. 1, 190 proof, special, dr.	gal. .45 - ...
No. 1, 188 proof, bbl.	gal. .52 - ...
No. 1, 188 proof, dr.	gal. .48 - ...
No. 5, 188 proof, bbl.	gal. .50 - ...
No. 5, 188 proof, dr.	gal. .44 - ...
Alum, ammonia, lump, bbl.	lb. .03 - .04
Potash, lump, bbl.	lb. .02 - .03
Chrome, lump, potash, bbl.	lb. .05 - .06
Aluminum sulphate, com. bags	100 lb. 1.40 - 1.50
Iron free bags	lb. 2.40 - 2.50
Aqua ammonia, 26%, drums	lb. .07 - .07
Ammonia, anhydrous, cyl.	lb. .30 - .30
Ammonium carbonate, powd. tech., casks	lb. .09 - .09
Ammonium nitrate, tech., casks	lb. .09 - .10
Amyl acetate tech., drums	gal. 4.50 - 4.75
Antimony oxide, white, bbl.	lb. .09 - .10
Arsenic, white, powd., bbl.	lb. .12 - .12
Arsenic, red, powd., kegs	lb. .15 - .15
Barium carbonate, bbl.	ton 63.00 - 65.00
Barium chloride, bbl.	ton 84.00 - 90.00
Barium dioxide, 88%, drums	lb. .17 - .18
Barium nitrate, casks	lb. .07 - .08
Blane fixe, dry, bbl.	lb. .04 - .04
Bleaching powder, f.o.b. wks. drums	100 lb. 1.75 - ...
Spot N. Y. drums	100 lb. 2.10 - .05
Borax, bbl.	lb. .05 - .05
Bromine, cases	lb. .28 - .30
Calcium acetate, bags	100 lb. 4.00 - 4.05
Calcium arsenate, dr.	lb. .11 - .11
Calcium carbide, drums	lb. .05 - .05
Calcium chloride, fused, dr. wks. Gran. drums works	ton 21.00 - ...
Calcium phosphate, mono, bbl.	lb. .06 - .07
Camphor, cases	lb. .77 - .78
Carbon bisulphide, drums	lb. .06 - .06
Carbon tetrachloride, drums	lb. .09 - .09
Chalk, precc—domestic, light, bbl.	lb. .04 - .04
Domestic, heavy, bbl.	lb. .03 - .04
Imported, light, bbl.	lb. .04 - .05
Chlorine, liquid, tanks, wks. Contract, tanks, wks.	lb. .04 - .04
Cylinders, 100 lb. wks.	lb. .05 - .06
Chloroform, tech., drums	lb. .30 - .32
Cobalt, oxide, bbl.	lb. 2.10 - 2.25
Copperas, bulk, f.o.b. wks.	ton 16.00 - 18.00
Copper carbonate, bbl.	lb. .18 - .19
Copper cyanide, drums	lb. .47 - .50
Copper sulphate, dom., bbl.	100 lb. 4.50 - 4.65
Imp. bbl.	100 lb. 4.37 - 4.50
Cream of tartar, bbl.	lb. .22 - .23
Epsom salt, dom., tech., bbl.	100 lb. 1.75 - 2.00
Epsom salt, imp., tech., bags	100 lb. 1.05 - 1.10
Epsom salt, U.S.P., dom., bbl.	100 lb. 2.25 - 2.50
Ether, U.S.P., dr.	lb. .13 - .16
Ethyl acetate, 85%, drums	gal. 1.10 - ...

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal. \$1.25 - ...
Formaldehyde, 40%, bbl.	lb. .11 - .11
Fullers earth—f.o.b. mines	ton 18.00 - 20.00
Furfural, works, bbl.	lb. .25 - ...
Fusel oil, ref., drums	gal. -
Fusel oil, crude, drums	gal. 4.00 - 4.25
Glauber salt, wks., bags	100 lb. 1.20 - 1.40
Glauber salt, imp., bags	100 lb. .95 - 1.05
Glycerine, e.p., drums extra	lb. .16 - .17
Glycerine, dynamite, drums	lb. .14 - .15
Glycerine, crude 80%, loose	lb. .10 - .10
Hexamethylene, drums	lb. .70 - .75
Lead:	
White, basic carbonate, dry, casks	lb. .09 - ...
White, basic sulphate, casks	lb. .09 - ...
White, in oil, kegs	lb. .11 - ...
Red, dry, casks	lb. .11 - ...
Red, in oil, kegs	lb. .13 - ...
Lead acetate, white crys., bbl.	lb. .14 - ...
Brown, broken, casks	lb. .13 - ...
Lead arsenate, powd., bbl.	lb. .18 - .20
Lime-Hydrated, bg., wks.	ton 10.50 - 12.50
Lime, Lump, bbl.	280 lb. 3.63 - 3.65
Litharge, comm., casks	lb. .11 - ...
Lithopone, bags	lb. .06 - .06
Magnesium carb., tech., bags	lb. .081 - .081
Methanol, 95%, bbl.	gal. .93 - ...
Methanol, 97%, bbl.	gal. .95 - ...
Methanol, pure, tanks, drums	gal. .90 - ...
Methyl-acetone, tks.	gal. 1.05 - 1.10
Nickel salt, double, bbl.	lb. .10 - .10
Nickel salts, single, bbl.	lb. .10 - .11
Orange mineral, cask	lb. .14 - .14
Phosgene	lb. .60 - .75
Phosphorus, red, cases	lb. .70 - .75
Phosphorus, yellow, cases	lb. .35 - .40
Potassium bichromate, casks	lb. .09 - .10
Potassium bromide, gran., bbl.	lb. .19 - .20
Potassium carbonate, 80-85%, calcined, casks	lb. .06 - .06
Potassium chlorate, powd.	lb. .07 - .08
Potassium cyanide, drums	lb. .47 - .52
Potassium first sorts, cask	lb. .081 - .081
Potassium hydroxide (caustic potash) drums	lb. .061 - .061
Potassium iodide, cases	lb. 3.65 - 3.75
Potassium nitrate, bbl.	lb. .071 - .09
Potassium permanganate, drums	lb. .14 - .14
Potassium prussiate, red, casks	lb. .45 - .48
Potassium prussiate, yellow, casks	lb. .20 - .20
Sal ammoniac, white, gran., casks, imported	lb. .061 - .061
Sal ammoniac, white, gran., bbl., domestic	lb. .071 - .071
Gray, gran., casks	lb. .08 - .09
Salsoda, bbl.	100 lb. 1.20 - 1.40
Salt cake (bulk) works	ton 22.00 - ...
Soda ash, light, 50% flat, bulk, contract	100 lb. 1.25 - ...
Soda ash, dense, bulk, contract, basis 50%	100 lb. 1.38 - ...
Soda, caustic, 76%, solid, drums contract	100 lb. 1.35 - ...
Soda, caustic, 76%, solid, drum contracts	100 lb. 1.45 - ...
Soda, caustic, ground and flake, contracts, dr.	100 lb. 3.50 - 3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb. 3.00 - ...
Sodium acetate, works, bbl.	lb. .05 - .05
Sodium bicarbonate, bulk	100 lb. 1.75 - ...
Sodium bicromate, casks	lb. .071 - .071
Sodium bisulphite (niter cake)	ton 6.00 - 7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb. .041 - .041
Sodium chlorate, kegs	lb. .061 - .07
Sodium chloride, long ton	12.00 - 13.00
Sodium cyanide, cases	lb. .19 - .22

Sodium fluoride, bbl.	lb. \$0.09 - \$0.10
Sodium hypophosphite, bbl.	lb. .021 - .021
Sodium nitrite, casks	lb. .071 - .08
Sodium peroxide, powd., cases	lb. .28 - .30
Sodium phosphate, dibasic, bbl.	lb. .031 - .031
Sodium prussiate, yel. drums	lb. .11 - .11
Sodium salicylic, drums	lb. .40 - .42
Sodium silicate (40°, drums)	100 lb. .75 - 1.15
Sodium silicate (60°, drums)	100 lb. 1.75 - 2.00
Sodium sulphide, fused, 62% drums	lb. .031 - .031
Sodium sulphite, crys., bbl.	lb. .031 - .031
Strontium nitrate, powd., bbl.	lb. .10 - .10
Sulphur chloride, yel. drums	lb. .041 - .05
Sulphur, crude	ton 18.00 - 20.00
At mine, bulk	ton 16.00 - 18.00
Sulphur, flour, bag	100 lb. 2.25 - 2.35
Sulphur, roll, bag	100 lb. 2.00 - 2.10
Sulphur dioxide, liquid, cyl.	lb. .08 - .08
Tin bichloride, bbl.	lb. .14 - .14
Tin oxide, bbl.	lb. .53 - ...
Tin crystals, bbl.	lb. .351 - .36
Zinc carbonate, bags	lb. .14 - .14
Zinc chloride, gran., bbl.	lb. .061 - .061
Zinc cyanide, drums	lb. .37 - .38
Zinc oxide, lead free, bags	lb. .061 - .061
5% lead sulphate, bags	10 to 35 % lead sulphate, bags
French, red seal, bags	lb. .061 - .061
French, green seal, bags	lb. .101 - ...
French, white seal, bbl.	lb. .12 - ...
Zinc sulphate, bbl.	100 lb. 2.75 - 3.25

## Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb. \$0.60 - \$0.65
Alpha-naphthol, ref., bbl.	lb. .65 - .80
Alpha-naphthylamine, bbl.	lb. .35 - .36
Aniline oil, drums	lb. .16 - .16
Aniline salts, bbl.	lb. .22 - .23
Anthracene, 80%, drums	lb. .75 - .80
Anthracene, 80%, imp., drums, duty paid	lb. .65 - .70
Anthraquinone, 25%, paste, drums	lb. .75 - .80
Benzaldehyde U.S.P., carboys f.f.c. drums	lb. 1.50 - ...
Benzaldehyde, tech., drums	lb. 1.60 - ...
Benzene, pure, water-white, tanks, works	gal. .25 - ...
Benzene, 90%, tanks, works	gal. .23 - ...
Benzidine base, bbl.	lb. .80 - .84
Benzidine sulphate, bbl.	lb. .72 - .75
Benzoin acid, U.S.P., kegs	lb. .83 - .86
Benzote of soda, U.S.P., bbl.	lb. .65 - .70
Benzyl chloride, 95-97%, ref., carboys	lb. .40 - ...
Benzyl chloride, tech., drums	lb. .25 - ...
Beta-naphthol, tech., bbl.	lb. .24 - .25
Beta-naphthylamine, tech.	lb. .75 - .80
Cresol, U.S.P., drums	lb. .25 - .29
Ortho-cresol, drums	lb. .28 - .32
Cresylic acid, 97%, works drums	gal. .72 - .73
95-97%, drums, works	gal. .67 - .68
Dichlorobenzene, drums	lb. .06 - .08
Diethylaniline, drums	lb. .49 - .51
Dimethylbenzene, bbl.	lb. .38 - .39
Dinitrobenzene, bbl.	lb. .18 - .20
Dinitrochlorobenzene, bbl.	lb. .21 - .22
Dinitronaphthalen, bbl.	lb. .30 - .32
Dinitrophenol, bbl.	lb. .35 - .40
Dinitrotoluol, bbl.	lb. .20 - .22
Dip oil, 25%, drums	gal. .30 - .35
Diphenylamine, bbl.	lb. .50 - .52
H-acid, bbl.	lb. .70 - .75
Meta-phenylenediamine, bbl.	lb. .95 - 1.00
Michler's ketone, bbl.	lb. 3.00 - 3.50
Monochlorobenzene, drums	lb. .08 - .10
Monooxylinylaniline, drums	lb. .95 - 1.10
Naphthalene, flake, bbl.	lb. .06 - .06
Naphthalene, balls, bbl.	lb. .60 - .65
Naphthionate of soda, bbl.	lb. .55 - .60
Naphthionone, acid, crude, bbl.	lb. .55 - .60
Nitrobenzene, drums	lb. .09 - .09
Nitro-naphthalene, bbl.	lb. .30 - .35
Nitro-toluolene, drums	lb. .131 - .14
N-W acid, bbl.	lb. 1.10 - 1.15
Ortho-amidophenol, kegs	lb. 2.30 - 2.35
Ortho-dichlorobenzene, drums	lb. .15 - .17
Ortho-nitrophenol, bbl.	lb. 1.20 - 1.30
Ortho-nitrotoluene, drums	lb. .11 - .12
Ortho-toluidine, bbl.	lb. .14 - .16
Para-amidophenol, base, kegs	lb. 1.30 - ...
Para-amidophenol, HCl kegs	lb. 1.55 - ...
Para-dichlorobenzene, bbl.	lb. .17 - .20
Paranitroaniline, bbl.	lb. .70 - .72
Para-nitrotoluene, bbl.	lb. .58 - .60
Para-phenylenediamine, bbl.	lb. 1.45 - 1.50
Para-toluidine, bbl.	lb. .88 - .90
Phthalic anhydride, bbl.	lb. .30 - .34
Phenol, U.S.P., dr.	lb. .28 - .36
Picric acid, bbl.	lb. .20 - .22
Pyridine, dom., drums	gal. nominal
Pyridine, imp., drums	gal. 3.50 - ...
Resorcinol, tech., kegs	lb. 1.40 - 1.50

Resorcinol, pure, kegs.....	lb. \$2.15 - .60
R-salt, bbl.....	lb. .55 - .60
Salicylic acid, teeth, bbl.....	lb. .33 - .35
Salicylic acid, U.S.P., bbl.....	lb. .35 - .35
Solvent naphtha, water-white, tanks.....	gal. .25 - .25
Crude, tanks.....	gal. .22 - .20
Gulphanilic acid, crude, bbl.....	lb. .18 - .20
Thio-carbanilide, kegs.....	lb. .35 - .38
Tolidine, bbl.....	lb. 1.00 - 1.05
Toluidine, mixed, kegs.....	lb. .30 - .35
Toluene, tank cars, works.....	gal. .26 - .30
Toluene, drums, works.....	gal. .30 - .50
Xyldine, drums.....	lb. .50 - .40
Xylene, pure, tanks.....	gal. .40 - .28
Xylene, com., tanks.....	gal. .28 - .28

**Naval Stores**

Rosin B-D, bbl.....	280 lb. \$5.70 - .
Rosin E-I, bbl.....	280 lb. 5.75 - .
Rosin K-N, bbl.....	280 lb. 6.10 - 6.80
Rosin W.G.-W.W., bbl.....	280 lb. 7.65 - 7.85
Wood rosin, bbl.....	280 lb. 5.80 - 5.90
Turpentine, spirits of, bbl.....	gal. 1.00 - .
Wood, steam dist., bbl.....	gal. .88 - .88
Wood, dest. dist., bbl.....	gal. .70 - .70
Pine tar pitch, bbl.....	200 lb. 5.50 - .
Tar, kiln burned, bbl.....	500 lb. 11.00 - .
Retort tar, bbl.....	500 lb. 11.00 - .
Rosin oil, first run, bbl.....	gal. .43 - .47
Rosin oil, second run, bbl.....	gal. .47 - .50
Rosin oil, third run, bbl.....	gal. .50 - .60
Pine oil, steam dist.....	gal. .60 - .62
Pine oil, pure, dest. dist.....	gal. .55 - .55
Pine tar oil, ref.....	gal. .35 - .35
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.....	gal. .30 - .30
Pine tar oil, double ref., bbl.....	gal. .70 - .70
Pinewood creosote, ref., bbl.....	.52 - .52

**Animal Oils and Fats**

Degras, bbl.....	lb. \$0.03 - \$0.05
Grease, yellow, loose.....	lb. .06 - .08
Lard oil, Extra No. 1, bbl.....	gal. .85 - .85
Neatsfoot oil 20 deg. bbl. No. 1, bbl.....	gal. 1.33 - .92
Oleo Stearine.....	lb. .88 - .92
Oleo oil, No. 1, bbl.....	lb. .10 - .15
Red oil, distilled, d.p. bbl.....	lb. .08 - .09
Saponified, bbl.....	lb. .08 - .09
Tallow, extra, loose.....	lb. .07 - .07
Tallow oil, acidless, bbl.....	gal. .86 - .86

**Vegetable Oils**

Castor oil, No. 3, bbl.....	lb. \$0.14 - .
Castor oil, No. 1, bbl.....	lb. .15 - .15
Chinawood oil, bbl.....	lb. .19 - .19
Coconut oil, Ceylon, bbl.....	lb. .10 - .08
Ceylon, tanks, N.Y.....	lb. .08 - .08
Coconut oil, Coshin, bbl.....	lb. .10 - .10
Corn oil, crude, bbl.....	lb. .12 - .09
Crude, tanks, (f.o.b. mill).....	lb. .12 - .09
Cottonseed oil, crude (f.o.b. mill), tanks.....	lb. .09 - .09
Summer yellow, bbl.....	lb. .10 - .10
Winter yellow, bbl.....	lb. .12 - .12
Linseed oil, raw, ear lots, bbl.....	gal. .93 - .87
Raw, tank cars (dom.).....	gal. .93 - .87
Boiled, ears, bbl. (dom.).....	gal. .95 - .95
Olive oil, denatured, bbl.....	gal. .10 - .10
Sulphur, (feet) bbl.....	lb. .02 - .02
Palm, Lagos, casks.....	lb. .07 - .07
Niger, casks.....	lb. .06 - .06
Palm kernel, bbl.....	lb. .09 - .09
Peanut oil, crude, tanks (mill).....	lb. .12 - .12
Peanut oil, refined, bbl.....	lb. .14 - .14
Perilla, bbl.....	lb. .14 - .14
Rapeseed oil, refined, bbl.....	lb. .87 - .87
Sesame, bbl.....	lb. .11 - .11
Soya bean (Manchurian), bbl.....	lb. .12 - .12
Tank, f.o.b. Pacific coast....	lb. .09 - .09
Tank, (f.o.b. N.Y.).....	lb. .10 - .10

**Fish Oils**

Cod, Newfoundland, bbl.....	gal. \$0.65 - \$0.67
Menhaden, light pressed, bbl.....	gal. .62 - .62
White bleached, bbl.....	gal. .64 - .64
Blown, bbl.....	gal. .68 - .68
Crude, tanks (f.o.b. factory).....	gal. .47 - .47
Whale No. 1 crude, tanks, coast.....	lb. .75 - .75
Winter, natural, bbl.....	gal. .78 - .78
Winter, bleached, bbl.....	gal. .78 - .78

**Oil Cake and Meal**

Cocoanut cake, bags.....	ton \$34.00 - .
Cottonseed meal, f.o.b. mills.....	ton 45.00 - .
Linseed cake, bags.....	ton 41.00 - .
Linseed meal, bags.....	ton 43.00 - .

**Dye & Tanning Materials**

Albumen, blood, bbl.....	lb. \$0.45 - \$0.50
Albumen, egg, tech, kegs.....	lb. .95 - .97
Cochineal, bags.....	lb. .32 - .34
Cuteh, Borneo, bales.....	lb. .04 - .04
Cuteh, Rangoon, bales.....	lb. .14 - .15
Dextrine, corn, bags.....	100 lb. 3.64 - 3.69
Dextrine, gum, bags.....	100 lb. 3.99 - 4.09
Divi-divi, bags.....	ton 38.00 - 39.00
Fustic, sticks.....	ton 30.00 - 35.00
Fustic, chips, bags.....	lb. .04 - .05
Gambier com., bags.....	lb. .11 - .11
Logwood, sticks.....	ton 25.00 - 26.00
Logwood, chips, bags.....	lb. .02 - .03
Sumac, leaves, Sicily, bags.....	ton 90.00 - .

**CHEMICAL AND METALLURGICAL ENGINEERING****Vol. 30, No. 7****February****Miscellaneous Materials**

Asbestos, crude No. 1, f.o.b., Quebec.....	sh. ton \$300.00 - \$400.00
Asbestos, shingle, f.o.b., Quebec.....	sh. ton 50.00 - 70.00

**Extracts**

Archil, cone, bbl.....	lb. \$0.16 - \$0.20
Chestnut, 25% tannin, tanks.....	lb. .02 - .03
Divi-divi, 25% tannin, bbl.....	lb. .04 - .05
Fustic, crystals, bbl.....	lb. .20 - .22
Fustic, liquid, 42%, bbl.....	lb. .08 - .09
Gambier, liq., 25% tannin, bbl.....	lb. .09 - .09
Hemlock, crys., bbl.....	lb. .14 - .18
Hemlock, 25% tannin, bbl.....	lb. .03 - .04
Hypernic, solid, drums.....	lb. .24 - .26
Hypernic, liquid, 51%, bbl.....	lb. .09 - .10
Logwood, crys., bbl.....	lb. .14 - .15
Logwood, liq., 51%, bbl.....	lb. .08 - .09
Quebracho, solid, 65% tannin, bbl.....	lb. .05 - .05
Sumac, dom., 51%, bbl.....	lb. .06 - .07

**Dry Colors**

Blacks-Carbonas, bags, f.o.b. works, contract spot, cases.....	lb. \$0.06 - \$0.08
Lampblack, bbl.....	lb. .10 - .14
Mineral, bulk.....	ton 35.00 - 45.00
Blues-Bronze, bbl.....	lb. .40 - .43
Prussian, bbl.....	lb. .40 - .43
Ultramarine, bbl.....	lb. .08 - .35
Browns, Sienna, Ital., bbl.....	lb. .06 - .14
Sienna, Domestic, bbl.....	lb. .03 - .04
Umber, Turkey, bbl.....	lb. .04 - .04
Greens-Chrome, C.P. Light, bbl.....	lb. .28 - .30
Chrome, commercial, bbl.....	lb. .12 - .12
Paris, bulk.....	lb. .26 - .28
Reis Carmine No. 40, tins.....	lb. 4.50 - 4.70
Iron oxide red, casks.....	lb. .10 - .16
Para toner, kegs.....	lb. 1.00 - 1.10
Vermilion, English, bbl.....	lb. 1.15 - 1.20
Yellow, Chrome, C.P. bls.....	lb. .17 - .17
Ocher, French, casks.....	lb. .024 - .03

**Waxes**

Bayberry, bbl.....	lb. \$0.25 - \$0.26
Beeswax, crude, Afr. bz.....	lb. .21 - .21
Refined, dried, bulk.....	lb. .32 - .34
Beeswax, refined, light, bags.....	lb. .40 - .41
Beeswax, pure white, cases.....	lb. .23 - .23
Candellina, bags.....	lb. .36 - .38
Carnauba, No. 1, bags.....	lb. .21 - .21
No. 2, North Country, bags.....	lb. .18 - .19
No. 3, North Country, bags.....	lb. .19 - .19
Japan, cases.....	lb. .054 - .06
Montan, crude, bags.....	lb. .04 - .04
Paraffine, crude, match, 105-110 m.p., bbl.....	lb. .04 - .04
Crude, scale 124-126 m.p. bags.....	lb. .04 - .04
Ref., 118-120 m.p., bags.....	lb. .04 - .04
Ref., 125 m.p., bags.....	lb. .05 - .05
Ref., 128-130 m.p., bags.....	lb. .051 - .051
Ref., 133-135 m.p., bags.....	lb. .051 - .051
Ref., 135-137 m.p., bags.....	lb. .051 - .051
Stearic acid, sngle pressed, bags.....	lb. .112 - .112
Double pressed, bags.....	lb. .112 - .112
Triple pressed, bags.....	lb. .13 - .13

**Fertilizers**

Acid phosphate, 16%, bulk, works.....	ton \$8.00 - \$8.25
Ammonium sulphate, bulk f.o.b. works, unit.....	ton 2.90 - .
Blood, dried, bulk.....	unit 4.10 - 4.15
Bone, raw, 3 and 50, ground.....	ton 26.00 - 28.00
Fish scrap, dom., dried, wks.....	unit 2.45 - .
Nitrate of soda, bags.....	ton 100 lb.
Tankage, high grade, f.o.b. Chicago.....	unit 3.25 - 3.35
Phosphate rock, f.o.b. mines Florida pebble, 68-72%.....	ton 4.00 - 4.50
Tennessee, 78-80%.....	ton 7.75 - 8.00
Potassium muriate, 80%, bags.....	ton 34.55 - .
Potassium sulphate, bags basis 90%.....	ton 45.85 - .
Double manure salt.....	ton 27.00 - .
Kainit.....	ton 7.22 - .

**Crude Rubber**

Para—Upriver fine.....	lb. \$0.21 - .
Upriver coarse.....	lb. .17 - .17
Upriver coarse ball.....	lb. .19 - .19
Plantation—First latex crepe	lb. .25 - .25
Ribbed smoked sheets	lb. .25 - .25
Brown crepe, thin, clean.....	lb. .24 - .24
Amber crepe No. 1.....	lb. .25 - .25

**Gums**

Copal, Congo, amber, bags.....	lb. \$0.10 - \$0.15
East Indian, bold, bags.....	lb. .20 - .21
Manila, pale, bags.....	lb. .19 - .20
Pontianak, No. 1 bags.....	lb. .19 - .20
Damar, Batavia, cases.....	lb. .22 - .22
Singapore, No. 1, cases.....	lb. .31 - .32
Singapore, No. 2, cases.....	lb. .21 - .22
Kauri, No. 1, cases.....	lb. .64 - .66
Ordinary chips, cases.....	lb. .20 - .21
Manjak, Barbados, bags.....	lb. .08 - .11
Shellac, orange fine, bags.....	lb. \$0.59 - .
Orange superfine, bags.....	lb. .61 - .
A. C. garnet, bags.....	lb. .56 - .
Bleached, bonedry.....	lb. .68 - .69
Bleached, fresh.....	lb. .56 - .
T. N., bags.....	lb. .56 - .57

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## CHEMICAL AND METALLURGICAL ENGINEERING

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0.00	Ferrochromium, per lb. of Cr, 1-2% C.....	lb.	\$0.30 -
70.00	4-6% C.....	lb.	.10 -
25.00	Ferroma nganee, 78-82% Mn, Atlantic seabd. duty paid.	gr. ton	109.00 -
17.00	Spiegeleisen, 19-21% Mn.....	gr. ton	38.00 - 40.00
14.00	Fermolybd en um, 50-60% Mo, per lb. Mo.....	lb.	2.00 - 2.50
24.00	Ferrosilicon, 10-12% Si, 50%.....	gr. ton	41.50 - 46.50
8.50	Ferrotungsten, 70-80% per lb. of W.....	lb.	.85 - .90
8.00	Ferro-uranium, 35-50% U per lb. of U.....	lb.	4.50 -
9.00	Ferrovanadium, 30-40% per lb. of V.....	lb.	3.50 - 4.00
0.00	<b>Ores and Semi-finished Products</b>		
8.00	Bauxite, dom. crushed dried, f.o.b. shipping points.....	ton	\$5.50 - \$8.75
7.00	Chrome ore, Calif. concentrates, 50% min. Cr <sub>2</sub> O <sub>3</sub> .....	ton	22.00 - 23.00
5.00	C.i.f. Atlantic seaboard... Coke, f.dry., f.o.b. ovens.....	ton	19.50 - 22.00
0.00	Coke, furnace, f.o.b. ovens.....	ton	5.25 - 5.75
0.00	Fluorspar, gravel, f.o.b. mines' Illinois.....	ton	4.00 - 4.15
0.00	Ilmenite, 52% TiO <sub>2</sub> Va.....	lb.	.01 -
0.00	Manganese ore, 50% Mn c.i.f. Atlantic seaport.....	unit	.42 - .46
0.00	Manganese ore, chemical (MnO <sub>2</sub> ).....	ton	75.00 - 80.00
0.00	Molybdenite, 8% MoS <sub>2</sub> , per lb. M O <sub>2</sub> , N. Y.....	lb.	.80 -
0.00	Monazite, per unit of ThO <sub>2</sub> , c.i.f. Atl. seaport.....	lb.	.06 - .08
0.00	Pyrites, Span., fines, c.i.f. Atl. seaport t.....	unit	.11 - .12
0.05	Pyrites, Span., furnace size c.i.f. Atl. seaport.....	unit	.11 - .12
0.06	Pyrites, dom. lines, f.o.b. mines, Ga.....	unit	.12 -
0.50	Rutile, 95% TiO <sub>2</sub> .....	lb.	.12 - .15
0.00	Tungsten, scheelite, 60% WO <sub>3</sub> and over.....	unit	9.50 - 10.00
0.00	Tungsten, wolframite, 60% WO <sub>3</sub> .....	unit	8.50 - 9.00
0.00	Uranium ore (carnotite) per lb. of U <sub>3</sub> O <sub>8</sub> .....	lb.	3.50 - 3.75
0.00	Uranium oxide, 96% per lb. U <sub>3</sub> O <sub>8</sub> .....	lb.	12.25 - 2.50
0.00	Vanadium pent oxide, 99%.....	lb.	2.00 - 14.00
0.00	Vanadium ore, per lb. V <sub>2</sub> O <sub>5</sub> .....	lb.	1.00 - 1.25
0.00	Zircon, 99%.....	lb.	.06 - .06

**Non-Ferrous Metals**

Copper, elec. troy tie.....	lb.	\$0.12 - \$0.12
Aluminum, 98 to 99%.....	lb.	.27 - .28
Antimony, wholesale, Chinese and Japanese.....	lb.	.10 -
Nickel, 99%.....	lb.	.26 - .30
Monel metal, shot and blocks.....	lb.	.32
Tin, 5-ton lots, Straits.....	lb.	.54
Lead, New York, spot.....	lb.	.0825
Lead, E. St. Louis, spot.....	lb.	.0885
Zinc, spot, New York.....	lb.	.075
Zinc, spot, E. St. Louis.....	lb.	.0672
Silver (commercial).....	oz.	.64
Cadmium.....	lb.	.70 - .75
Bismuth (500 lb. lots).....	lb.	2.30
Cobalt.....	lb.	2.50-3.00
Magnesium, ingots, 99%.....	lb.	.90 - .95
Platinum.....	oz.	122.00
Iridium.....	oz.	83.00
Palladium.....	oz.	60.00
Mercury.....	75 lb.	.95-1.00
Tungsten.....	lb.	

**Finished Metal Products**

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled.....	19.50
Copper bottoms.....	29.50
Copper rods.....	20.00
High brass wire.....	18.00
High brass rods.....	15.50
Low brass wire.....	20.00
Low brass rods.....	20.50
Brazed brass tubing.....	23.50
Braided bronze tubing.....	25.00
Seamless copper tubing.....	23.50
Seamless high brass tubing.....	22.00
OLD METALS—The following are the dealers purchasing prices in cents per pound:	
Copper, heavy and crucible.....	10.00 @ 10.25
Copper, heavy and wire.....	9.871 @ 10.00
Copper, light and bottoms.....	8.00 @ 8.25
Lead, heavy.....	6.62 @ 6.87
Lead, tea.....	3.26 @ 3.87
Brass, heavy.....	5.25 @ 5.50
Brass, light.....	4.50 @ 4.75
No. 1 yellow brass turnings.....	5.00 @ 5.12
Zinc scrap.....	3.75 @ 4.00

**Structural Material**

The following base prices per 100 lb. are for structural shapes 3 in. by  $\frac{1}{4}$  in. and larger, and plates  $\frac{1}{4}$  in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes.....	\$3.54	\$3.54
Soft steel bars.....	3.54	3.54
Soft steel bar shapes.....	3.54	3.54
Soft steel bands.....	4.39	4.39
Plates, $\frac{1}{4}$ to 1 in. thick.....	3.64	3.64

## CHEMICAL AND METALLURGICAL ENGINEERING

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**Industrial**

Financial, Construction and Manufacturing News

**Construction and Operation****Alabama**

MONTGOMERY—The Gulf States Chemical & Refining Co. has plans for a local plant for the manufacture of calcium arsenate and other similar products, with initial output of about 25 tons per day. The company has leased a local power plant of the Montgomery Light & Power Co., and will use for service at the works.

BESSEMER—The Bessemer Galvanizing Works, Inc., has construction under way on a local plant and plans to commence operations soon. The works will be used for the zinc galvanizing of structural steel and iron and other products, operating under a "hot dip process." Headquarters of the company are at Birmingham, Ala.

FAIRFIELD—The Tennessee Coal, Iron & Railroad Co., Birmingham, Ala., has plans for the immediate erection of an addition to its local foundry for the production of steel castings, and will install equipment to double the present output. The cost is reported in excess of \$45,000. George G. Crawford is president.

**California**

FULLERTON—The Western Glass Co. has awarded a general contract to the Union Iron Works, Los Angeles, for the construction of a new plant in the city industrial district, with main unit to be 1-story, 200x800 ft. A power house will be erected. The project is estimated to cost \$350,000, including equipment. W. D. French is superintendent of construction for the company.

SAN FRANCISCO—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will take bids until Feb. 26, for 10,000 lb. muriatic acid for the Mare Island Navy Yard, as specified in Schedule 1860.

LOS ANGELES—The Southern California Gas Co. has plans in progress for extensive additions and improvements in its artificial gas plants, to include the installation of considerable new equipment. Permission has been asked to issue bonds for \$1,500,000 and stock for \$1,000,000, the majority of the proceeds to be used for the work.

**Florida**

TAMPA—The Florida-McCracken Concrete Pipe Co., P. O. Box 872, Sanford, Fla., recently organized with capital of \$300,000, has selected a local site and will soon commence the erection of a new plant for the manufacture of concrete sewer pipe, estimated to cost \$50,000. It will supplement a works at Sanford, now in course of construction. W. J. McCracken is president.

MIAMI—The Royal Palm Sugar Cane & Planting Co., recently organized, has purchased a tract of 30,000 acres of land in the Royal Palm Hammock section of Cape Sable County. Sugar cane planting on a tract of about 250 acres will be commenced at once, to be increased gradually to a large acreage. At a later date it is proposed to construct a grinding mill and sugar refinery, to cost in excess of \$400,000. A power house will be built. J. F. Jaudon is president. Paul C. Taylor, Miami, attorney, is interested in the new organization.

CLEARWATER—The Common Council has tentative plans under advisement for the installation of an artificial gas plant to cost approximately \$150,000. Bonds will be issued.

**Georgia**

AUGUSTA—The International Vegetable Oil Co. plans rebuilding the portion of its plant destroyed by fire, Feb. 5, with loss estimated at \$17,000.

**Iowa**

DAVENPORT—The Northwest Davenport Block Co., 1725 Davie St., is perfecting plans for the erection of a new plant on West Locust St., for the manufacture of cement blocks and other cast cement products, estimated to cost \$28,000, with equipment. H. E. Maier is general manager.

**Kentucky**

LOUISVILLE—The United States Foil Co., manufacturer of tin foils, is reported to have plans under advisement for a new plant at Grand and 13th Sts., to cost approximately \$20,000.

**Louisiana**

MONROE—The Chester Carbon Co., 315 Ouachita National Bank Bldg., has commenced the construction of its proposed carbon black manufacturing plant on site along the line of the Missouri Pacific R.R., recently acquired. Two complete units will be built, each to cost about \$250,000, with machinery. A gasoline-refining plant will also be erected in the near future. Percy P. Learned is president.

**Massachusetts**

HAVERHILL—The Haverhill Gas Light Co. is planning for the construction of an addition to its local artificial gas-manufacturing plant to increase the output by about 3,000,000 cu.ft. per day. New coal-gas generating equipment and auxiliary apparatus will be installed. The company is operated by Stone & Webster, Inc., 147 Milk St., Boston.

**Michigan**

DETROIT—The Peerless Portland Cement Co., First National Bank Bldg., has commenced the construction of its proposed new mill on site at River Rouge, recently acquired, and plans to have the plant ready for service within 10 to 12 months. It will comprise a number of units, with total rated output of 130,000 bbl. per month, and will cost in excess of \$1,000,000, with machinery. Contracts for grinding machinery and other equipment are being let. John Gillespie is president, and A. L. Miller, construction engineer.

MIDLAND—The Dow Chemical Works, Inc., is planning for the early rebuilding of the portion of its plant recently destroyed by fire, caused by an explosion. The estimated loss has not been announced.

**Minnesota**

LITTLE FALLS—The Itasca Paper Co., 4th and Minnesota Sts., St. Paul, Minn., has commissioned the Jacobson Engineering Co., 1645 Hennepin Ave., Minneapolis, Minn., engineer, to prepare plans for its proposed local mill on site lately acquired, and plans to commence work on the initial buildings at an early date.

**Missouri**

JOPLIN—The Eagle-Picher Lead Works, Inc., Smelter Hill, has plans for the erection of a new building at its local plant, to be 1-story, 40x145 ft. It will be used for general operating service. Work will soon be commenced.

**New Jersey**

NEWARK—The Celluloid Co., Wilson Ave., has filed plans for a 1-story addition, to be used for general operating service.

JERSEY CITY—The A. E. Hull Pottery Co., Pacific Ave. and Caven Point Rd., is having plans drawn for the erection of a 2-story building at its plant, 65x225 ft.

**New York**

NORTH TONAWANDA—The American Radiator Co., Buffalo, has tentative plans under advisement for the construction of one or two new blast furnaces at its local pig iron plant, including a battery of by-product coke ovens. One of the present blast furnaces has recently been remodeled, and it is said that the other existing stack will be dismantled to make way for the new units. Frey Brassert & Co., 122 South Michigan Ave., Chicago, Ill., are engineers.

**Ohio**

WOODVILLE—The Bruns Hydrated Lime Co., recently organized with a capital of \$450,000, will commence immediately the erection of a new local plant. It will consist of a main unit and auxiliary structures, estimated to cost approximately \$200,000.

including equipment. J. W. Bruns, Woodville, is president; and A. W. Shields, Toledo, O., secretary.

**TOLEDO**—The Libbey-Owens Sheet Glass Co., Nicholas Bldg., will take bids at once for the construction of a 1-story plant unit, 100x190 ft., on site east of the city limits, recently purchased. The structure will be used for the production of plate glass and is estimated to cost in excess of \$350,000, with equipment. Lockwood, Greene & Co., 24 Federal St., Boston, Mass., are architects and engineers.

### Pennsylvania

**YORK**—The York Paper Mfg. Co., recently organized with a capital of \$135,000, will operate a local mill for the manufacture of roofing papers and other paper products for the building industry. Charles and Jacob Lefean, York, head the company.

**FARRELL**—The American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh, Pa., a subsidiary of the United States Steel Corp., New York, will have plans prepared for the construction of four new sheet mills at its local plant, designed to increase the capacity close to 50 per cent, with employment of about 400 additional men. The expansion is estimated to cost approximately \$800,000, including auxiliary structures and equipment.

**TARENTUM**—Fire, Feb. 7, destroyed a portion of the plant of the Foccus Glass Co., 2nd Ave., with loss reported at \$25,000, including equipment. It is planned to rebuild.

**PHILADELPHIA**—The Philadelphia Copper-smithing Co., 222 North Front St., has filed plans and will commence the immediate construction of an addition to its plant at 810-14 North Front St., estimated to cost \$25,000.

### Tennessee

**MARTIN**—The Chambers-Godfrey Mfg. Co. has acquired the Hester Building, Broadway, and will remodel and equip the structure for the manufacture of special compounds.

**NASHVILLE**—The Liberty Brick & Tile Co., 116 21st Ave., South, has tentative plans under advisement for the installation of a tunnel kiln at its plant, and auxiliary equipment for increased output. R. M. Hall is president.

**SAINT ELMO**—Edward Fowler and F. E. Lewis, officials of the Fowler-Lewis Cultivator Co., Chattanooga, Tenn., are planning for the organization of a new company to construct and operate a local plant for the reclaiming of waste oils. The initial works are estimated to cost about \$60,000, with equipment.

### Texas

**WACO**—The Texas Calcium Arsenate & Lime Co., has been organized with a capital of \$600,000 by S. C. Williams and associates, to operate a plant in this vicinity. The company will take over the plant and property of the Waco Lime Products Co., located about 25 miles from Waco, and purposed to develop to maximum capacity, with projected early expansion. The plant has a present rating of 100 tons of lime and 40 tons of calcium arsenate per day. The acquisition also includes extensive lime properties at McGregor, Tex. Mr. Williams will be president of the new company; J. L. Spurlin, Sr., Waco, is vice-president; and W. H. Hanover, McGregor, secretary and treasurer.

**CISCO**—The Western Oil Sales Corp. has acquired the local oil-refining plant of the Eastland Pioneer Co., and plans for immediate operation. Extensions and improvements will be made.

**BRECKENRIDGE**—Fire, Jan. 31, destroyed a building at the plant of the Col-Tex Co., near Breckenridge, manufacturer of carbon black, with loss estimated at \$20,000. It is planned to rebuild.

### Virginia

**BEDFORD**—The Bedford Tire & Rubber Co., recently organized, is preparing to commence work on its proposed local plant for the manufacture of tires and other rubber products, to be 1-story, 80x300 ft., to cost approximately \$75,000. L. R. Gills is president, and J. J. Scott, secretary and treasurer.

**LEXINGTON**—The Board of Trustees, Washington and Lee University, has awarded a general contract to Angle & Moesser, Lexington, for the erection of the proposed chemical laboratory at the institution, to be 3-story and basement, 65x135 ft., estimated to cost \$150,000, including equipment. Work will be commenced at

once. Flounoy & Flounoy, 1211 Connecticut Ave., Washington, D. C., are architects.

**RICHMOND**—The Clay Products Co. has acquired a site about 2 miles from the city, and has plans under way for the construction of a new plant, consisting of two main mills and power house, to cost approximately \$100,000, with equipment. The initial works will comprise four kilns, equipped for oil fuel. W. L. Riggelman is secretary.

### Washington

**VANCOUVER**—The American By-Products Co., Donegan Bldg., recently organized with a capital of \$2,000,000, has taken over the interests of the Chemical By-Products Industries, Inc., and plans for extensive operations. A tract of more than 800 acres of lignite properties near Kelso, Wash., has been acquired, and plans are under way for the construction of a plant for the extraction of oils and various byproducts. The plant will have an initial capacity of 250 tons per day. Henry C. Prudhomme is secretary and general manager.

### To Readers of the Industrial Section

#### Is this section of interest to you?

A revision of the service is planned that will mean the elimination of these departments from the paper, and distribution by mail to those who find it of value.

If you wish to be included in such a distribution, write to the Industrial Editor, *Chemical & Metallurgical Engineering*, Tenth Ave. at 36th St., New York City, and specify the headings that you want.

**VALLEY**—The Northwest Magnesite Co., Chewelah, Wash., has acquired the local properties of the American Mineral Production Co., for a consideration of about \$1,000,000. Plans are under way for extensions, with additional equipment.

### West Virginia

**HUNTINGTON**—The Charles Boldt Glass Co., Cincinnati, O., manufacturer of bottles and other hollowware products, is planning for extensions at its branch plant at Huntington. It is purposed to dismantle a portion of the Cincinnati works, removing the equipment to the local plant, and install additional apparatus. Headquarters will be continued at Cincinnati.

**MORGANTOWN**—The University of West Virginia has commenced the construction of a new chemical laboratory, for which a general contract was recently awarded to Fordman & Putnam, Marietta. It will cost approximately \$650,000, including equipment.

### New Companies

**DUNN SULPHITE PAPER CO.**, Port Huron and Detroit, Mich.; paper and pulp products; 10,000 shares of stock, no par value, and \$25,000. Incorporators: R. G. Lambrecht, Charles F. Clippert and Charles F. Bornman, 680 Delaware Ave., Detroit.

**SOUTH OTTAWA SILICA CO.**, 411 Central Life Bldg., Ottawa, Ill.; silica and kindred products; \$20,000. Incorporators: Thomas E. White, F. A. Cebulske and J. J. Schumerman.

**GENERAL PHOSPHORUS CO.**, Cincinnati, O.; phosphorus and affiliated products; \$25,000. Incorporators: James R. Clark, Burton E. Robinson and William J. McCauley, all of Cincinnati.

**HOUSTON GRAPHITE CO.**, Boston, Mass.; graphite products; \$100,000. Russell Burrage is president; and Charles D. Burrage, Needham, Mass., treasurer.

**BORAD CHEMICAL CO.**, New York, N. Y.; chemical products; 100 shares of stock, no par value. Incorporators: R. Peyton, W. V. Saxe and M. Donnelly. Representative: Stanchfield & Levy, 120 Broadway, New York.

**INK-OUT MFG. CO., INC.**, Montclair, N. J.; printing inks; \$25,000. Incorporators: Florence Peer and John D. Cardinell, 15 Label St., Montclair. The last noted is representative.

**GAGNON CLAY PRODUCTS CO.**, Green Bay, Wis.; burned clay products; \$25,000. Incorporators: J. and C. Gagnon, both of Green Bay.

**ANN ARBOR CHEMICAL CO.**, Detroit, Mich.; chemical specialties; \$15,000. Incorporators: N. S. Shapero, Robert S. Strieffing and Edward Hirschfeld, 1135 Lincoln Ave., Ann Arbor.

**SUNSET PAPER MILLS, INC.**, Los Angeles, Calif.; paper and pulp products; \$500,000. Incorporators: Charles Gordon, Harvey M. Murray, and Peter C. Bruce, all of Los Angeles. Representative: L. R. Wharton, 320 A. G. Bartlett Bldg., Los Angeles.

**ORIFICE GASOLINE PRODUCTION CO.**, Desdemona, Tex.; gasoline and other petroleum byproducts; \$70,000. Incorporators: F. L. Towsley, Louis J. Kreller and A. C. H. Snyder, all of Desdemona.

**STROOCK & WITTENBERG CORP.**, New York, N. Y.; paints, varnishes, etc.; \$51,000. Incorporators: J. F. Moroney, S. Stroock and C. L. Grad. Representative: Wolf & Kohn, 277 Broadway, New York.

**OAK TIRE & RUBBER CO.**, 1107 Continental Bldg., Baltimore, Md.; tires and other rubber products. Incorporators: Edward D. Robins and Stanley Richardson.

**ZELDES SMELTING & REFINING CO.**, Detroit, Mich.; metal smelting and refining; \$10,000. Incorporators: Jacob Zeldes, Harry N. Ruby and May Zeldes, 4239 Brush St., Detroit.

**DYE, DRUG & CHEMICAL CORP.**, Woodbridge, N. J.; chemicals and chemical by-products, dyes, etc.; \$50,000. Incorporators: Edmund P. Lorimer, Henry Sherman and Joseph White, Woodbridge. The last noted is representative.

**OLIVE-VENTURA OIL CORP.**, Los Angeles, Calif.; refined petroleum products; \$100,000. Incorporators: Roy D. Barnum, J. W. Jameson and S. W. McComb. Representative: Black, Hammack & Black, 419 American Bank Bldg., Los Angeles.

**SHINE-HI PRODUCTS CORP.**, Buffalo, N. Y.; polishes; \$50,000. Incorporators: J. and A. H. Messersmith, and C. V. Wenple. Representative: J. A. Hahl, attorney, Buffalo.

**NORTHERN BRONZE CORP.**, Philadelphia, Pa.; bronze, brass and kindred products; \$20,000. A. F. Leopold, 601 West Horter St., Philadelphia, is treasurer.

**ELYRIA PETROLEUM CO.**, care of J. M. Gagan, 335 United States National Bank Bldg., Denver, Colo.; petroleum and by-products; \$100,000. Incorporators: J. M. Cones, F. D. Rock and L. A. Gilbert.

**EXCEL ASBESTOS MFG. CO.**, New York, N. Y.; asbestos products; \$20,000. Incorporators: A. Gradiolone and A. Kleb. Representative: McDonald, 51 Chambers St., New York.

**REINFORCED PAPER PRODUCTS CORP.**, care of the Corporation Trust Co. of America, du Pont Bldg., Wilmington, Del., representative: paper products; \$1,000,000.

**REFINERS' OIL CORP.**, Cincinnati, O.; refined petroleum products; \$500,000. Incorporators: Robert S. King, Fowler S. Parrott and W. E. Talbott, all of Cincinnati.

**NON-GLARING HEADLIGHT CO.**, Plant City, Fla.; \$25,000; glass products. J. A. Burney, Plant City, is president.

**WELDO RUBBER CO.**, Brooklyn, N. Y.; rubber products; \$25,000. Incorporators: S. M. Wittner, A. and R. Lader. Representative: Anderson, Phillips & Moss, 565 5th Ave., New York.

### Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CAUSTIC SODA and soda ash. Amritsar, India. Purchase and agency.—9117.

CAUSTIC SODA, 50 to 100 tons monthly. Frankfurt, Germany. Purchase.—9124.

FERTILIZERS. Barranquitas, Porto Rico. Agency.—9133.

MATCHES. Barranquitas, Porto Rico. Agency.—9133.

PAINT, luminous. Vienna, Austria. Purchase.—9091.

PAINTS. Latin America. Agency.—9079.

POTASH, etc. Mexico City, Mexico. Purchase.—9144.